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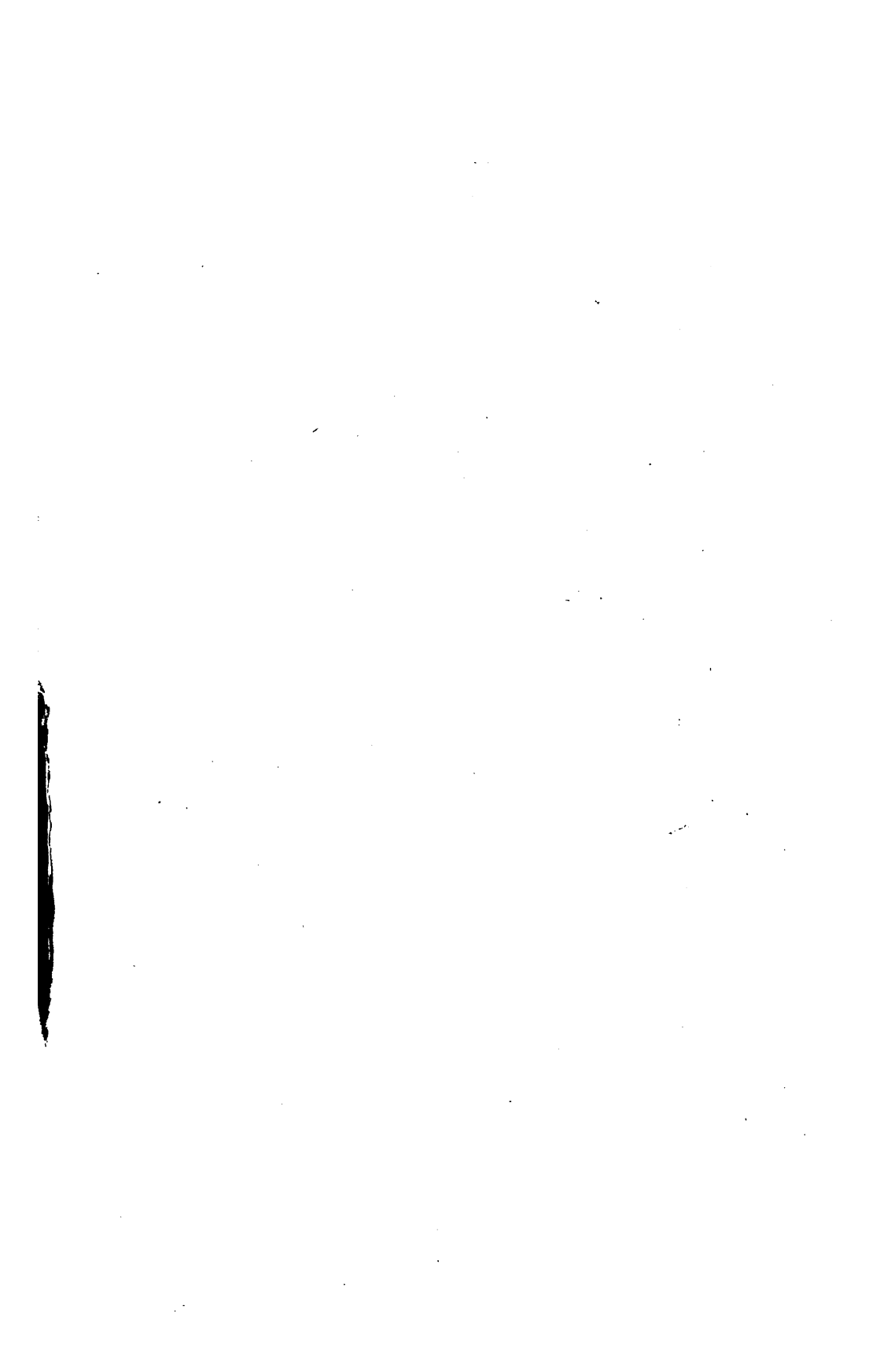
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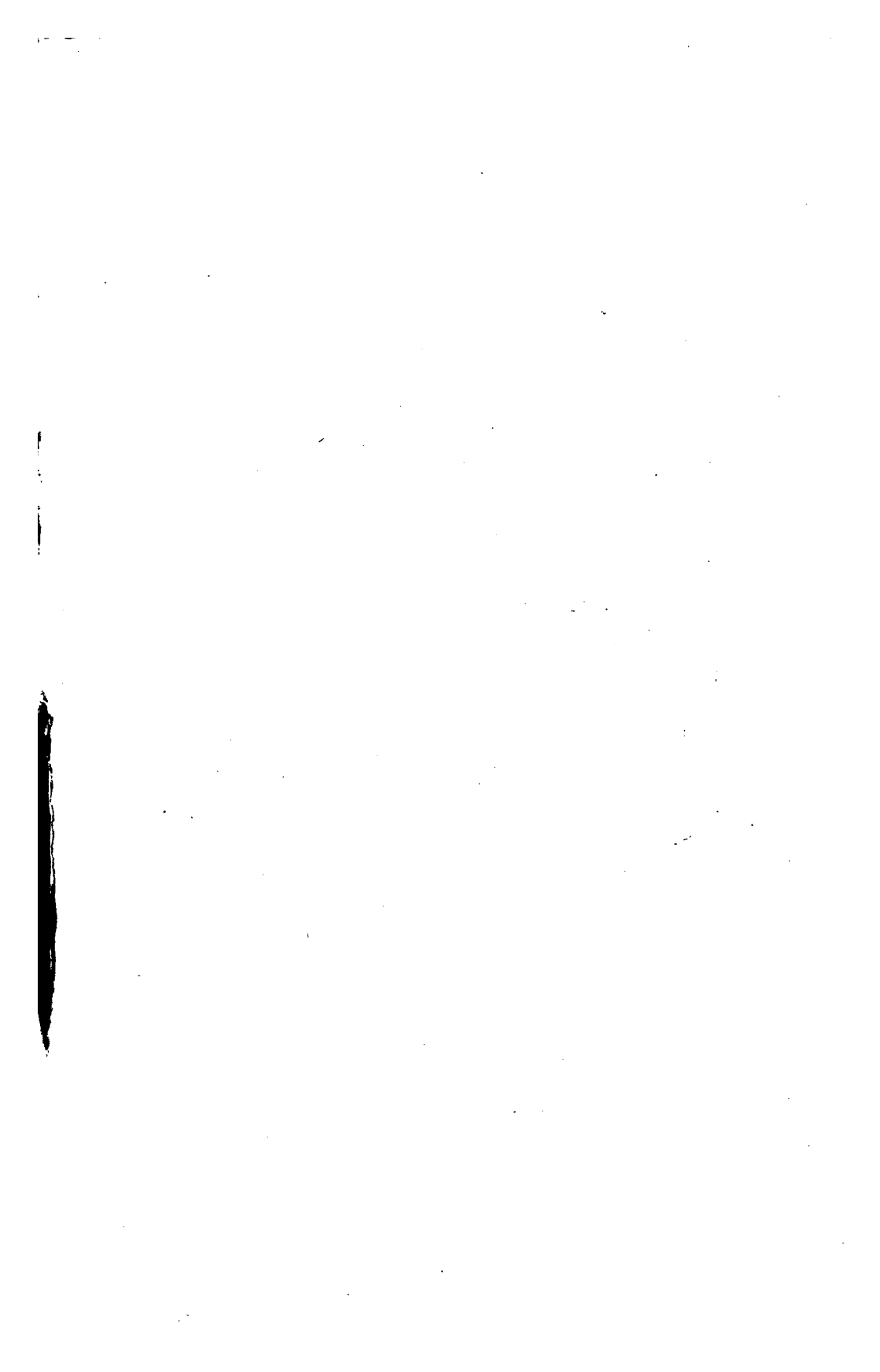
Gough At. Brown  
p. 61.

A copy containing the plates  
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Gough At. Devon  
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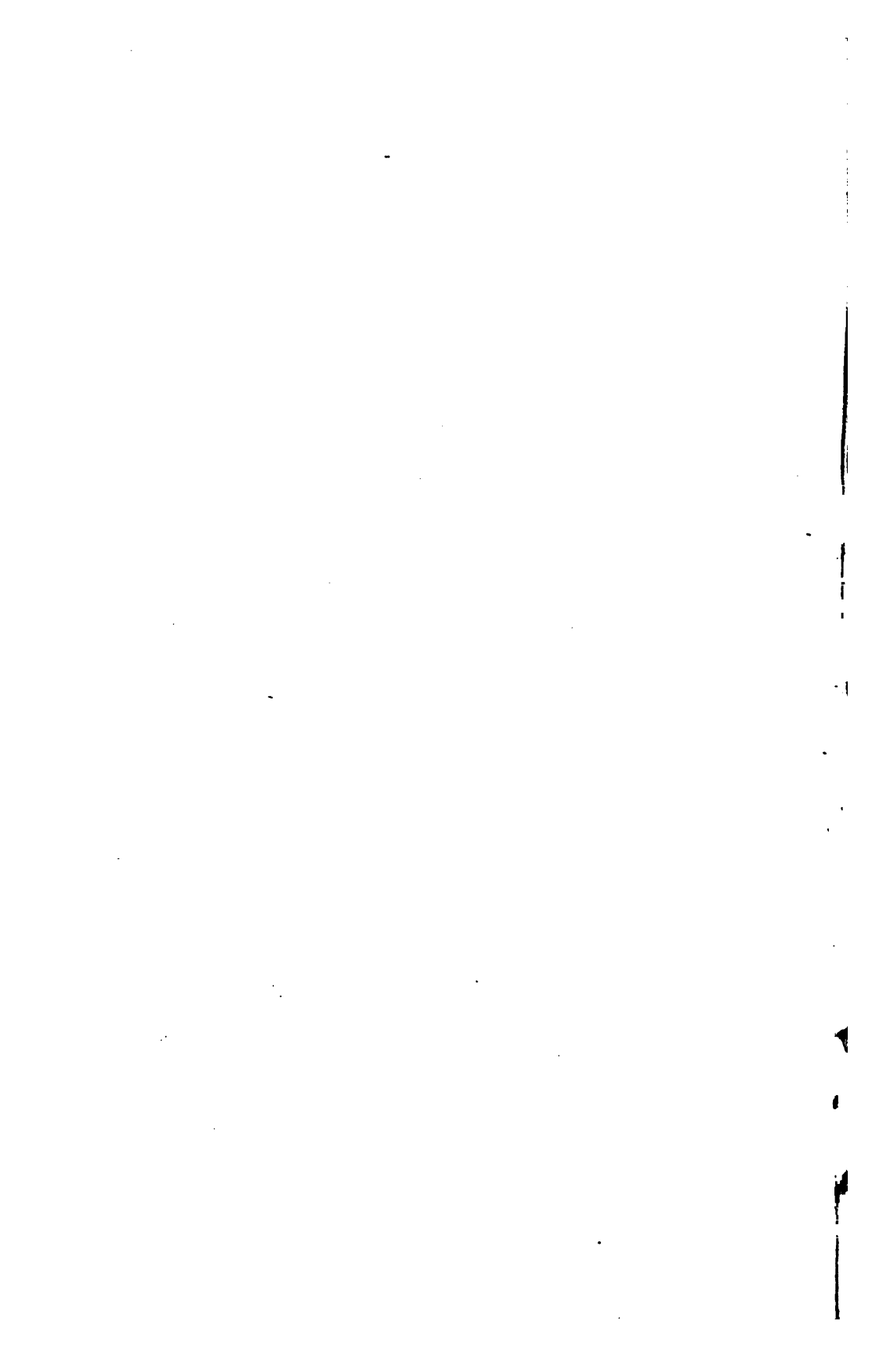
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## **CAVERN RESEARCHES.**





# CAVERN RESEARCHES,

OR,

## DISCOVERIES OF ORGANIC REMAINS,

AND OF

BRITISH AND ROMAN RELIQUES, IN THE CAVES OF KENT'S  
HOLE, ANSTIS COVE, CHUDLEIGH, AND BERRY HEAD :

BY THE LATE

REV. J. MACENERY, F.G.S.,

Hon. Member of the Yorkshire, Bristol, &c. &c. Phil. s. s.

*Edited from the original Manuscript Notes,*

BY

E. VIVIAN, Esq.,

Member of the Sub-Committees appointed by the Geological Society, and Torquay  
Natural History Society, for conducting the Excavations in Kent's Cavern,  
and the newly-discovered Cave at Brixham.

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## P R E F A C E.

The following Memoir is compiled from the original manuscript notes of the late Rev. J. MacEnery, for many years Chaplain at Tor Abbey, by whom the cavern was first explored. From the Prospectus it appears, that, when completed, it was to have been illustrated with thirty plates, by Scharf, representing the fossil remains of the natural size, with sections and ground plans of the principal caverns, "the limited circulation of works of this nature, however, being by no means equal to the expenses attendant upon the execution of so large a series," the Author, after a second appeal was compelled to abandon his design. At his death the vast and invaluable collection of fossil remains was sold by auction, and, unhappily, dispersed; the manuscript was purchased in a lot of sermon notes and other papers by the late Mr. Lear, of Lawrence Place. It was for many years overlooked and supposed to be altogether lost to science. This circumstance and the value attached to Mr. MacEnery's labours are thus referred to by Professor Owen, the highest authority on these subjects, in his *History of British Fossil Mammalia* :—"Perhaps the richest cave-depository of bears hitherto found in England is that called Kent's Hole, near Torquay. It is to the assiduous researches of the Rev. Mr. MacEnery that the discovery of the various and interesting fossils of this cave is principally due, and some of the rarest and most valuable of this gentleman's collection have been recently acquired by the British Museum. \* \* Mr. De Blainville frequently cites a 'Description of the Cavern of Kent's Hole, Devonshire,' which he supposes to have been published by Mr. MacEnery, but which he regrets that he had not been able to procure." I have been assured by Dr. Buckland that Mr. MacEnery never published such a work, but it is most probable that the drawings or lithographic impressions shewn by Mr. MacEnery to Professor De Blainville were those designed to illustrate the forthcoming second volume of the

*Reliquiæ Diluvianæ.* Having accidentally discovered that the greater portion of the Memoir was in the possession of Mr. Lear, I published some extracts in the "Torquay Directory" with reports of Lectures which I delivered before the Natural History Society. It was subsequently purchased, with Mr. Lear's cabinet of fossils, by W. Long, Esq., F.G.S., who most liberally presented it to me with a view to its publication. The manuscript is in a very imperfect state, consisting of fragments of the original notes, a portion being re-written several times with considerable alterations. In order to preserve the freshness of first impressions, and the exact statement of Mr. MacEnery's views I give it, as far as possible, verbatim, scrupulously making no addition, and only omitting those passages which are in duplicate or irrecoverably mutilated, and re-adjusting the whole, as far as practicable, in a connected series. The notes upon Berry Head Cavern, referred to in the title page, are entirely lost. It was explored by the late Rev. F. Lyte in conjunction with Mr. MacEnery, and afforded similar results with the other caverns; also some human remains, supposed to be those of the Roman garrison.

Of the plates above referred to, sixteen were executed at the expense of the late lamented Dean of Westminster, and by the liberality of his son, F. Buckland, Esq. (2nd Life Guards), I have been permitted to have some proof impressions taken, to illustrate large paper copies.

The profits of this edition will be placed at the disposal of the Torquay Natural History Society, who, by permission of the proprietor, Sir L. V. Palk, Bart., propose to resume their explorations of Kent's Cavern. I take this opportunity of stating that as this will be effected by a special fund, donations will be very acceptable. The researches in the newly-discovered cavern at Brixham, by a grant from the Royal Society, cause the subject to be now more than ordinarily interesting, and a careful comparison of the results obtained from each, will, it is hoped, throw much light upon this most interesting page of Geology and earliest human antiquities.

E. VIVIAN.

WOODFIELD, TORQUAY,  
1st Jan. 1859.

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## ORIGIN OF CAVERN RESEARCHES.

Researches of this nature do not date far back in this country. Except as places of popular resort, caverns attracted little notice before their fossil contents were brought to light. Had this event occurred at an earlier period, they would, doubtless, have been regarded with the same feelings that those were in which bones were first discovered in Germany. There they were generally reported to be the sepulchres of fabled animals, and styled after them the "Dragon's Grottoes."

As their relics were presumed to possess supernatural virtues, they were sought for as charms and cures; and in course of time rose into such estimation, as a sovereign specific, that they finally took their station in the *materia medica*, under the designation of the *Liquor fossilis*. Nothing more was wanting to make them an object of speculation, to supply the demands for which, the mountains were ransacked for caverns, and the caverns for bones, a circumstance to which may be traced the discovery of both one and the other over a large tract of the Continent.

From the people, as happens in most cases, the subject passed into the hands of men of science. It now became important to ascertain if these mysterious relics were the remains of the animal to which popular belief assigned them. It is not difficult to conceive how the multitude, ever prone to the marvellous, should have been led astray by their imagination, but that the learned should have persisted in attributing them to a chimæra, whose prototype, it was gravely contended, still existed in Transylvania, it is not so easy to comprehend. Others saw a resemblance to a hippopotamus, but it could only apply to its bulk.

In this posture stood the controversy when comparative anatomists interposed, with the immortal Cuvier at their head, and having first shewn from the immutable laws observed in nature, in the structure of her works, that no such monster could have proceeded from her hands, and that it was purely a creation of the fancy of painters and poets, they transferred the disputed remains to an extinct species of bear, essentially different from the modern in its form and size.

A similar misapprehension prevailed with respect to the nature of

the fossil bones discovered in the plains. From their occurring in the earth, the people of the north of Asia concluded that they had belonged to an animal which lived, like the mole, underground, and perished as soon as it saw the light. Thence it was called Mammoth—Earth-born.

Even by the learned they were regarded, during the middle ages, as the remains of giants.—It was at no very distant period that they were assigned to the Elephant and Mastodon.—Their tusks were wrought up for the same purposes as recent ivory, and the enamel of their teeth, stained by the oxide of copper, passed as an article of commerce, for turquoise.

The species of the cavern animal being once determined, the transition was easy as to the cause of its inhumation in such regions. Already had the speculative genius of naturalists on the Continent been long exercised in search of a clue to the difficulty, when the discovery of similar phenomena in the cleft of a rock in Yorkshire, by some labourers employed in working a quarry, brought the subject under the consideration of British geologists.

A leading member of one of the Universities repaired to the spot, seized the facts as they revealed themselves, and speedily announced those results which profess to resolve the problem.

An appeal, however, having been made to a larger search for confirmation of these views, a fresh impulse was given to the labours of those engaged in this field of enquiry.

Both continents were accordingly explored for further evidence, and with such effect that almost each new arrival brought home parcels of fossil remains collected from rivers, lakes, and superficial gravel, throwing light, at least, upon the co-ordinate branch of the question, incorporated with the theory of caves, concerning the distribution of correlative animals through the soil over the surface of the globe.

Nor was illustration on the point immediately under consideration slow in following. The unexpected discovery of a living Hyena's retreat, in India, the threshold and floor of which were strewn over with the half-devoured carcasses of animals of the country, disclosed coincidences with the cavern of Kirkdale, such as the most sanguine could have scarcely dared to anticipate.

In the meantime excavations were carried on in superficial deposits and caves in France and the Netherlands, affording results bearing on the question which shall be discussed in the sequel. Nor were naturalists at home behind their brethren abroad in industry and skill. Each district was examined, either by men qualified by habit and science, or by persons, like myself, compelled solely by a general



interest in the research. Thus was a spirit of enquiry widely propagated among all classes, in the short space of a few years, during which it may be asserted, that more light has been struck out on the condition of the earth, than in the same number of centuries preceding it. By the concurrent discoveries of comparative anatomists on the continent, and Geologists aided by chemists in this country, that rapid approach was made to a knowledge of the nature and revolutions, physical constitution and history, of the globe, which advanced the private pursuit of a few naturalists, to the rank of science, second only to the sublimest of all studies, in the grasp of its views and importance of its inductions.

The cavernous nature of the limestone on the coast of Devonshire did not fail to attract Geologists from a distance, whilst those living in its vicinity pressed forward to anticipate the researches of strangers, and to bear away from them the palm of original discovery.

Kent's Cavern was too generally frequented from the earliest periods, as an object of natural curiosity, not to draw attention to it as most likely to afford organic remains. So far back as 1823-4, it had already been visited by the person most concerned in its disclosures, but the pressure of professional duties permitted him, it appears, little more than a cursory glance at its surface.

In the meantime the ground was broken by others impatient to lift the veil from its depths, some of whom sought the elucidation of an important question involved in its history, while others avowedly looked there only for a color to preconceived theories respecting its conformation and contents.

Mr. Northmore, who had already traversed the county in search of Druidical and Roman antiquities, is understood to have been the first that discovered the existence of its fossil reliques. We refer to his own statement, it being best to let him relate in his own words his impressions respecting it; the reader will be thus enabled to judge of the degree of weight that should attach to this gentleman's speculations.

"In the month of September, 1824, I visited, with my family, Torquay, without having the remotest idea of making any excavations in its caverns for the purpose of discovering their hidden treasures, but with the full and avowed design of examining Kent's Hole for a very different object, viz., to ascertain whether it were or were not a Mithratic cavern; for the Druidical priesthood, like their Egyptian, Chaldean, and Brahminical brethren, worshipped in such cavernous recesses, whether natural or artificial, the Solar God, under a variety of names;

such as Mindhar, or Mithras, Bel, Belinus, Beluenus, Belatucader, the Tyrian Hercules, Cocideus, &c., while the Eastern titles of that Deity were more generally those of Osiris, Orus, Thoth, Budha, Cueshua, Mahadera, or Seera, and more than a hundred others. In several of these deep and gloomy caverns or temples, which mystically represented the Diluvial abyss, and particularly in those of Elephanta or Ellora in Hindostan the emblems of the *Deus Genitor* yet remain. \* \*

"Having mentioned my intention to my brother-in-law, Captain Welby, resident at Torquay, who had the beautiful work of Belzoni, on the Pyramids of Egypt, lying on his table, he kindly offered it for my perusal, thinking it might be of service to me in my Mithratic pursuits, as in truth it really was; for the fact is, that the Pyramids of Egypt, as was the tower of Babel, were built for the same object and mystery. The water of the sacred Nile was brought into them and used for the same purpose of Baptismal Regeneration as the natural "pellucid water" of Castletown cave, and Kent's Hole, and the rock basins and stone bowls of the nymphs and Druids; and the tanks and reservoirs of the Hindoo pagodas were designated to a similar end.

"It now occurred to me that I might, as the saying is, kill two birds with one stone, and extract as many organic remains from our Devonian caverns as the Professor had done at Kirkdale. With both these objects then in view, I hired two assistants (W. Rossiter and John Ferris) and accompanied by an able draughtsman, Mr. Gendall, of Exeter, I set out, on the 21st Sept., 1824, with the double object of discovering organic remains, and ascertaining the existence of a temple of Mithras; and happy am I to say that I was successful in both objects. In the former pursuit, indeed, I have been followed by hundreds, in the latter by none. The Baptismal lake of "pellucid water" the "creeping path" of stone, purification, and, if I am not quite mistaken, for I speak doubtfully, the "mystic gate of obstacle,"—the "oven mouth," and possibly one more arcane memorial sufficiently satisfied my mind upon the temple of the extensively worshipped, and thousand named Deity Belus;—but upon this subject no more at present,—I proceed to the organic remains of the sacred Arkæan cave.

"On entering the Cavern, and being at that time a novice in the art of exploring, I began to consider in what part it was most likely to find the expected treasures, and seeing a small recess, which I technically called a den, on the left side, some way in the cavern, of a size sufficiently capacious to hold a large tiger, I began to dig therein, through the stalagmitic covering, and in less than three minutes I

could not forbear exclaiming with joy, "here it is," and I pulled out an old worn-down tusk of the Hyena, and soon afterwards a metatarsal bone of the cavern bear. About twenty or thirty other teeth and bones were the result of that day; but among them, and what I much prized, were the two jaws, upper and lower, of either the wolf or the fox; these I placed, as I thought, safely in my basket, but upon my return to my lodgings I found they were gone, and, though I subsequently offered a reward to the finder, I was never able to recover them. Such, then, were the fortunate results of the first day, and my object was complete, for in truth my views turned more to principles than mere matters of fact and experience."

Mr. Northmore was speedily followed by a gentleman well known to the scientific world for his contributions to almost every department of knowledge. Though not the original discoverer, Mr. W. C. Trevilian was certainly the first that obtained any results of value to science, which he lost no time, on his return to London, in making known; he had an excellent engraving executed by Miss Morland, the present Mrs. Buckland, exhibiting single teeth of Rhinoceros, Hyena, and Tiger, with jaws of the Bear and Fox, and one or two considerable bones.

This, it appears, was the extent of what was known of the Cavern up to 1825; too little, manifestly, to satisfy the longing of the public for the fullest information. The existence of fossil bones referrible to five species was established, it is true; but in what number, and in what state, and under what conditions the great body of organic remains occurred, these were enigmas that this handful of fossils was insufficient to solve.

It is at this point that my labours commence, of which, though late, I propose to lay the narrative before the public. I had hoped, and it was to be desired, that the subject would have been taken up in the interval by those better able to handle it; and it was in this expectation that I had long laid aside all intention of sending my notes to the press. Other and greater undertakings have retarded the execution of the design where I know it was contemplated. There remains to me, therefore, no other alternative than to yield to the duty which my discoveries impose on me, towards science, by publishing an account of what I know of the Cavern, and avail myself of the return of health accorded to me by a merciful Providence to record those researches, from which illness, not improbably occasioned by them, had long compelled me to desist. It being my desire to present a faithful picture of this extraordinary repository of the relics of succes-

sive ages, I pray the reader to transport himself to the scene and follow me through its depths, that he may be witness and judge of the facts which shall be exposed to his view. For this purpose it will be necessary to enter into minute details, which in a work dealing in general conclusions built upon previously ascertained facts might have been dispensed with. Though at the close of our researches we should give expression to the irresistible inferences at which we arrived, our aim is rather to supply matter to others than to speculate ourselves. Thus much we thought it necessary to premise before entering upon our narrative.

### OCCASION AND RESULT OF FIRST VISIT.

To the following incident I am indebted for first directing my steps towards the Cavern.

Having one morning in the summer of 1825 chanced to hear my friend Captain Welby express his intention to join an exploring party there, I was induced to accompany him. We found his relation Mr. Northmore, of whom mention has already been made, at its entrance, surrounded by about a dozen persons, among whom were remarked the Commander of the Coast Guard and his men, all busy in equipping themselves for their expedition under ground.

The passage being too narrow to admit more than one person at a time, and that only in a stooping posture, the company entered in files, each bearing a light in one hand and a pick-axe in the other, headed by a guide carrying a lantern before the chief of the party. I made the last of the train, for I could not divest myself of certain undefinable sensations, it being my first visit to a scene of this nature. As soon as the party was assembled in the vestibule Mr. Northmore ascended a rock, from which he delivered instructions to the group around him, respecting the plan to be pursued in their operations during the day. He next distributed the Coast Guard through the several chambers, and employed himself in passing to and fro superintending their proceedings; notwithstanding which there was little or nothing added, on that occasion, to what was already known of the Cavern; indeed no individual, with his single arm, could do more than pierce the crust superficially. If instead of these desultory proceedings all hands had been brought to bear on any particular point, they must necessarily have reached the bones, for there is no part where they may not be found below the stalagmite.

The party were, however, somewhat consoled for their disappointment

by the discovery, in the black mould, of certain rudely shaped pieces of oak, one of which was immediately shewn me by Mr. Braham, the finder; it was about the length and form of the human foot, and hollowed in the centre, not unlike a sandal. I accordingly gave it the name which it has since borne of the "Druid's sandal." The designation, although applied only in allusion to the lecture we have just heard, was too good not to be caught up and adopted, as it seemed to countenance certain fanciful doctrines then promulgated with all the authority of an oracle.

Perceiving that it was in vain to look for the fossils without first piercing the crust, which stood between them and the mould under-foot, I betook myself alone, to a spot which had the appearance of being disturbed. It was one of those perforations in the floor which further observation enabled us to trace to burrowing animals, situated half way down the vestibule, or sloping chamber, in a cove on the right against the wall. The mouth was partially choked up with soil, of which a heap was thrown up round its margin, it was slightly glazed over with the droppings, the earth was of a reddish brown, unctuous to the touch, and from the presence of a profusion of recent bones, bore evident marks of frequent disturbance. On tumbling it over, the lustre of the enamel soon betrayed its contents; they were the first fossil teeth I had ever seen, and as I laid my hand on these relicts of distinct races, and witnesses of an order of things which passed away with them, I shrunk back involuntarily; though not insensible to the excitement attending new discoveries, I am not ashamed to own, that, in the presence of these remains, I felt more of awe than joy; but whatever may have been the impressions or speculations that rushed into my mind, this in not the place to indulge them; my present business is with facts.

I pursued my search in silence, and kept my good fortune a secret, fearing that amidst the press and avidity of the party to possess some fossil memorial of the day, my discoveries would be damaged, or perhaps share the fate of those abstracted from Mr. Northmore's basket. I was anxious to send them in a state in which they were found to Oxford.

In addition to the specimens of the five species figured in Mr. W. C. Trevilian's plate, there appeared several new ones, belonging to horse, deer, hare, rabbit, &c., head of field rat, (Campagnol) and a small feline or cat, with the bones of two species of birds. But the most remarkable discovery of all, was of the upper jaw of a hyena, the bone of which was eaten away close to the roots of the teeth, and even the upper portion, or gum, bore impressions of gnawing. The whole was accompanied by bones belonging, principally, to the small quadrupeds, some

of which were fractured at their extremities as if by the bite of a dog and their barrels loaded with mud; along with the above was sent a lump of the soil through which were disseminated small splinters of bone, and teeth of the compagnol, the whole was immediately drawn on stone in a superior style, by the lady who executed Mr. Trevilyan's plate; this may be regarded as the first gleam of light that was thrown on the condition of the contents of the Cavern. My communication was followed by an answer which urged me to follow up my good fortune. [Dr. Buckland's letter, which is directed to be inserted here, is unfortunately lost.]

### GENERAL GEOLOGICAL VIEW OF THE DISTRICT OF THE CAVERN.

Before entering into further details of the proceedings, it is fit the reader should be presented with a brief outline of the geology of the environs of the cavern.

Devonshire is traversed through its centre by the great Granite chain which rises in Cornwall, dividing the county, like its spine, into two nearly equal parts, north and south.—The latter we have to describe at present.

This district, the tourist need not be told, is distinguished from the rest of England by those ridges and Tors, which diversify its surface, and impart to it much of its picturesque character.

Besides the granite, which skirts it on the North-west, (and on the side of which, it may be observed in passing, the Bovey Lignite reclines) the rocks are composed of two principal classes, viz, limestone (attended by its conglomerate above and shale below) and old red-sandstone (accompanied by its silicious group) on which the limestone reposes.

The Limestone ranges in an almost uninterrupted line from Petit-Tor to Devonport, embracing in its course among other towns, St. Mary-Church, Torquay, Totnes, and Ivy Bridge.—Until recently, it was always esteemed a member of the Transition series. Mr. De la Beche succeeded, by a comparison of its organic remains, in establishing its identity with the Carboniferous species. Another high authority, however, is disposed, for the sake of simplicity, to retain its ancient classification, considering it convenient to include within the Transition series all kinds of stratified rocks from the earliest slates, in which we find the first traces of animal and vegetable remains, to the termination of the great coal formation, "the animal remains in the more ancient position

of this series, viz., the Grauwacke group, being nearly allied in general, and differing only in species, from those in its more recent portion, viz., the Carboniferous group." (Bridg. T. p. 60.) It reposes on old red-sandstone, or, more strictly speaking, on beds of argillaceous shale interposed between it and the sandstones with which in some places it is seen to interstratify, and into which in others it seems to pass.\*

From Meadfoot, where it reposes on red-sandstone, it proceeds to Upton, where it forms a zone round the shale; it thence stretches out in a tongue as far as Coffinswell. At this point it disappears under the Exeter Conglomerate. Emerging again at Kingskerswell, it holds on its march to Newton. Thence it may be traced through the vallies of Bradley and Ogwell, successively to Ipplepen, Dartington, and Totnes on its road to Plymouth, where it rejoins the branch which followed the line of the coast and from which it was separated by the intervention of schist.

Its laminae are of various density, from a few inches to several feet. They attain great thickness in the quarries of Park Hill. In texture it passes from compact to Crystalline, especially in the vicinity of Trap. Its ordinary color is a pearly grey, occasionally assuming shades of deeper intensity.

The semi-crystalline variety of Petit-Tor broken into boulders of several tons weight, and composing a massive species of Conglomerate, supplies those curiously tinted marbles, which nearly rival the Italian, and are worked up at St. Mary-Church for like purposes of art.

The shale with which the limestone alternates, in its upper members takes a reddish hue, and a brownish grey in its lower, and, according to the authority of Mr. De la Beche whose views we follow in this sketch, is identical with the shale of Pembroke.

The Conglomerate which overlies it, is composed of fragments torn from the parent rock which it overlies. One of the most curious examples existing, is in the loose masses (of which we have spoken as furnishing ornamental marbles) at Petit-Tor, resting, in the form of conglomerate, on their native bed of limestone, and which are thought to have been detached by the action of water.

We have lastly to speak of the old red-sandstone, on which the limestone and shale rest. It is, according to Mr. Conneybeare, a continuation of that silicious group which stretches south from the vale of Taunton

\* This group has since been classified as a distinct formation, the Devonian, from its fullest development, being in this county. It has been identified by Sir R. Murchison with beds similar in geological, although not always in mineralogical character in Scotland and Russia. It is intermediate between the silurian and carboniferous systems.—E. V.

into Devonshire,—advancing along the vale of Crediton to Exeter, and thence to the coast, in a southern and continuous direction by Chudleigh and the Teign, terminating at the S.W. angle of Torbay, between which and the Teign a branch runs in among the limestone,—another bends its course inland through Chelston and Cockington, occasionally disappearing beneath the Exeter conglomerate. Under the red silicious grit of Meadfoot occurs a grey fissile and micaceous sandstone. It traverses the point of land called *Hope's Nose*, sustaining the limestone. This grit rock is traversed by veins of trap, like the red grit of Meadfoot in contact with the limestone of Kent's Hole.

To the west of Babbicombe, trap pierces upwards through the argillaceous shale into the limestone, the adjacent beds of which are fractured and contorted, and portions of them inclosed in the mass of trap. The shale is elevated to the summit of the cliffs at Oddicombe, as well as the adjoining red-sandstone. The sandstone strata, between Livermead and Cockington, are confusedly huddled together,—the dip being at all angles. Such disturbance of the lower strata could not fail to be felt by the upper. Accordingly we find the limestones and shales included in the trap. No where, except in the Alps, have I seen paralleled the contortions in the strata which Mr. De la Beche, at the time he was engaged in the examination of this district, pointed out to my notice, diagrams of which he has since given in his works. In the valley of Luterbrünnen and on the left flank of the Lake of Lucerne near Flüellen, may be seen *sections*, on a grander scale, which remind one of the bent strata of this district.

Such is the confusion prevailing through the whole that there is no where to be obtained a regular dip. In one quarry near the Torquay turnpike, the dip is at an angle of 35, at another little farther on the strata are vertical. On the new line through Stony Valley, the limestone projects from the sides of the ridges in bold crags, or bends over at the entrance, by the roadside, into natural arches.

The southern arm of Torbay exhibits evidence of convulsion no less decisive than that of the north. From Berryhead to Saltern Cove the limestone is blended together with the trap, and its calcareous quality so modified in consequence, that it almost refuses to effervesce with acids.

From this it is evident that the strata of this district have undergone two distinct revolutions—

1. From the action of water, in the abrasion of the rocks, the debris of which are accumulated in the form of conglomerate on the parent beds.



2. From the agency of another and more tremendous power, viz., of trap, in piercing through, bending, and ultimately enclosing solid masses of limestone and shale,—an event which Mr. De la Beche connects with the elevation, by the same cause, of the chalk and Oolitic formations in this country, and of the loftiest mountain range on the continent. This limestone may be justly called, from abounding with caverns, the Cave Limestone, as the Jura formation has been designated, for the same reason, Höhlenkalk.—There is a chain of caverns from Kent's Hole extending through Dean and Buckfastleigh to Plymouth. It is strongly impregnated with iron, to which it is indebted for the variety of its tints. Carbonate of Lime and sulphate of Barytes are found in the veins.

For a fuller description of the formations of this district, which yields in interest to no other quarter of the globe, and from which Mr. De la Beche has drawn some of his most instructive illustrations, I must refer to his work, and others which treat expressly on the subject, where it will be seen that the geological construction of this region as justly merits a preeminent place in the annals of the structure of our globe, as does Kent's Hole among the caverns in its bowels.

#### APPROACH TO THE CAVERN.

It is in the midst of this scene of disorder that the rock of Kent's Cavern rises, halfway between St. Mary-Church and Torquay, from each of which places it is about a mile distant.

Those who may be desirous to view the district just sketched, preparatory to a visit to the cavern, should approach it from the St. Mary-Church road, which sweeps down by Anstis' Cove, showing the nature and condition of the strata on a sufficiently intelligible scale.—From the Roman camp on the Down, the eye may follow the outline of the coast from the limit of the limestone at Petit-Tor, to the junction of the sandstone with the chalk. On a clear day the Oolitic island of Portland may also be descried.

The approach from Torquay is by a lane, near the turnpike, which terminates in a wooded valley, flanked on both sides by ridges of limestone. In that on the right is situated the cavern. The ascent to it is gradual. The way lies over a stony gap, after which it winds up through brushwood in front of the mouths.

The grey masses scattered down the side, as ready to drop from the brow of the hill,—its rugged and creviced surface, through which the coppiswood strikes into the interior,—its stratification partly vertical,

partly horizontal, are so many traces of the igneous revolution, which, at a remote period, seems to have created the cavern for the reception of the aqueous deposits of a later convulsion, and those evidences which connect the primitive with the historic period.

Two apertures near the summit of the hill give access to the cavern. That on the right appears to have always been the favorite entrance. It is simply a cleft in the rock, of the shape of a wedge reversed, diminishing from its base upwards; it is about seven feet wide at the bottom and five feet high. Before the removal of the mould to render the passage more accessible the cleft was not more than four feet high. The mouth on the left is a shallow arch formed by a natural span of the strata, loose masses of which project above, overhanging the entrance. In its present state it has no more than three feet of elevation, but in its natural condition, before the soil was raised as a fence against cattle, it was about five feet in height and nine in breadth. When we cleared away the rubbish we found the rock floor polished as by constant use. On the inside the entrance rises rapidly and spreads out into a spacious vault.

These mouths are about 46ft. apart from each other, nearly in a line, and upon the same side of the rock, of the irregularity of whose beds their remarkable difference of form is a just type.

In giving an account of our excavations, we shall follow the order pursued by the guides, so that those who may have visited, or who may hereafter visit the cavern, may be enabled to follow us.

We shall commence then with the common entrance—thence follow the direct course of the upper gallery,—and its lateral branches or sallyports. We shall then return on our steps as far as the vestibule, or sloping chamber, and, without stopping, advance by the arcade into the cave at its extremity,—from which we shall turn on the left into the region of the Bear's Den or of the "Water."

We shall return thence by the oven, retrace our steps by the arcade, traverse once more the sloping chamber in our way to the Wolf's Den, which forms its right branch, and finally terminate our labours in the grand vestibule or Hyena's Den.

### ANTIQUITIES AND HUMAN REMAINS.

The floor we found at our first visit covered, through its whole extent, with a darkish mould, varying in depth from a few inches to a foot. It only dates since the Cavern became a popular place of resort, and the further progress of the stalagmite in open situations was

interrupted by the trampling of visitors. In the vestibule were found, deep imbedded in it, those curiously shaped pieces of oak to which the appellation of Druids sandal was given, as has been remarked,—together with a quantity of decomposed animal and vegetable matter, the remains of fires and feasts, mingled with rabbit bones.

Opposite the lower mouth, in the lower division, is an interesting little grotto formed by the bending over of a flag of stalagmite into an arch elevated only two or three feet above the level of the floor. The mouth was closed up with a blackish mould, in digging which, in quest of pottery, we broke into a circular cell, the aperture is scarcely sufficiently ample to admit a person lying on his breast, the space inside being in circumference only a few feet. The floor was covered with stalagmite, in the surface of which were inserted large shells with the cup uppermost as if placed to collect the droppings. The entire skeleton of an animal resembling a Badger, and portions of the upper jaw of a Hog with one of its tusks indicating great magnitude, were scattered over the earth, and in the midst of all a barbed spear of iron. These relics were severally invested with a crust of stalagmite like the specimens from the German and English dropping wells, and reposed with their under surface inlaid in the floor. Its vicinity to the mouth and its secrecy incline me to the opinion that it was used as a place of refuge or ambush, from which its tenant sallied forth in chase of game. The wild Boar continues to be hunted with the spear; the large animal, some of whose remains were preserved here, may have fallen by the spear which lay near it. Many of the bones when stripped of their spar were found discolored as if by smoke; pieces of charcoal indicated the remains of a fire. The lowness of the roof, and the depth of the crust beneath, prevented further search in the heart of this cell.

In the crevices of the rock, and in the cavities occasioned by the overlapping of fallen masses, were concealed the skeletons of such animals as strayed or retired hither to die, such as dog, hare, rabbit, sheep, and the remains of the bat, with its delicate framework, spread out on the black mould, were particularly noticed.

But, for greater precision and perspicuity, I shall take the chambers in the order they are visited in. To commence with the common entrance.—Here once for all I must solicit indulgence for entering into details apparently unimportant.—In this cavern are found grouped together phenomena which have only been observed separately in others, dispersed over divers countries. By closely examining the disclosures of this, a clue may be obtained to all. At the hazard of unnecessarily charging the thread of my narrative with seemingly

frivolous particulars, I proceed to note down the characters presented by its general aspect, no less than its contents, before it was altered by those operations which have since left no part of it in its virgin state. It is only on a just appreciation of all their circumstances that a true estimate can be founded of those facts which should serve as the basis of all reasoning on its nature and history.

The floor of the entrance, except that it had the appearance of being broken up, offered nothing remarkable to detain us;—we shall have occasion to return to it presently. Not so the lateral branch by which it communicates with the body of the cavern on the left,—at this point so great was the obstruction, from the accumulation of mould and a fallen ledge of rock lying across the way, that those who then visited it will not have forgotten their accomplishing the passage on all fours. These impediments have been partly removed. Under a similar ledge, on the left, still standing, was found the usual sprinkling of modern bones, and, in the mould beneath, which had acquired the consistency of hard clay, were found fragments of pottery, calcined bones, charcoal, and ashes;—in the midst of all were dispersed arrow heads of flint and chert;—the ashes furnished a large proportion of the mould.

In the same heap were discovered round slabs of roofing slate of a plate-like form, some crushed, others entire. The pottery is of the rudest description, made of coarse gritty earth, not turned on a lathe, and sunbaked,—on its external margin it bears zig zag indentations, not unlike those represented on the urns found by Sir Richard Hoare, in the barrows of Wiltshire. These fragments, there seems no reason for doubting, are the remains of cinerary urns which once contained the substances scattered round, and to which the slates served for covers.

At a short distance nearer the entrance were found, in a continuation of the same mould, articles of bone of three sorts,—some of an inch long and pointed at one end, or arrow heads,—others about three inches long, rounded, slender, and likewise pointed. Conjecture was long busy as to their destination,—they were thought by some to be bodkins, by others, for confining the hair, like those ornaments used by the women in Italy;—lastly, they were supposed, with more probability, to be a species of pin for fastening the skin in front which served savages for garments.

The shaggy wolfish skin he wore,  
Pinned by a polished bone before.

The third article does not seem quite so easy to explain—it is of a different shape, quite flat, broad at one end, pointed at the other—

the broad part retains the truncated form of a comb, the teeth of which were broken off near their root,—whether it was used as a comb, or for making nets for fishing, is not clear. There was only this solitary one found, and two of the former, but several of the first, with a quantity of bone chips. All three bore marks of polish.

Nearer the mouth were collected a good number of shells of the muscle, limpet, and oyster, with a palate of the scarus. This, as well as the nacker of oysters, which was thickly disseminated through the mould, served, as they do at the present day among savages, most probably for ornament. The shellfish may have furnished bait for fishing. The presence of these rude articles render it probable that they were collected here by the ancient Aborigines, who divided their time between the chase and fishing in the adjacent sea.

Close to the opposite wall, in the same passage, buried in black mould, I found a stone hatchet, or celt, of Sienite, the only one found in the cavern. Another of the same material, but of a different shape, I found shortly after, not far from the cavern near Anstis Cove, which the labourers engaged in making the new cut had just thrown up with the mould.

As we advanced towards the second mouth, on the same level were found, though sparingly, pieces of pottery. The most remarkable product of this gallery were round pieces of blue slate, about an inch and a half in diameter and a quarter thick. It may have served like the Kimmeridge coal, for money. In the same quarter were likewise found several round pieces of sandstone grit, about the form and size of a dollar, but thicker and rounded at the edge and in the centre pierced with a hole, by means of which they seem to have been strung together like beads. Clusters of small pipes or icicles of spar, such as depended from the roof at our first visit, we saw collected here in heaps, buried in the mud. Similar collections we had occasion to observe accompanied by charcoal, throughout the entire range of the cavern, sometimes in pits excavated in the stalagmite. Copper ore—with these various articles in the same stuff was picked up—a lump much oxydized, which the late Mr. Phillips analyzed, was found to be pure virgin ore. Though this branch of the cavern is more spacious and the mouth more ample, it by no means furnished an equal proportion of antiquities to the other.

Several of these articles were slightly encrusted with a pellicle of stalagmite, according as they happened to lie within the reach of the drop when exposed as the surface.

Having taken a general survey of the surface of the floor, we returned to the point from which we set out, viz., the common passage,—for the

purpose of piercing into the materials below the mould. Here, in sinking a foot into the soil (for of stalagmite there remained only the broken edges adhering to the sides of the passage, and which appeared to be repeated at intervals), we came upon flints in all forms—confusedly disseminated through the earth, and intermixed with fossil and human bones, the whole slightly agglutinated together by calcareous matter derived from the roof.

My collection possesses an example of this aggregation in a mass consisting of pebbles, clay, and bone, in the midst of which is embedded a fine blade of flint, all united together in sparry cement.

The flints were in all conditions, from the rounded pebble as it came out of the chalk, to the instruments fabricated from them, as arrow and spear-heads, and hatchets.

Some of the flint blocks were chipped only on one side, such as had probably furnished the axes, others had been on several faces, presenting planes corresponding exactly to the long blades found by their side, and from which they had been evidently sliced off,—other pebbles were still more angular, chipped at all points; which were no doubt those which yielded the small arrow-heads—which abounded in by far the greatest number,—small irregular splinters, not referrible to any of the above divisions, and which seem to have been struck off in the operation of detaching the latter, not unlike the small chips in a sculptor's shop, were thickly scattered through the stuff, indicating that this spot was the workshop where the savage prepared his weapons of the chace, taking advantage of its cover and the light.

I have discovered in this passage precisely similar arrow-heads to those which I detected in an urn from a Barrow presented to me by the Rev. Mr. Welland.

With the exception of the Boar spear and a blade of the same metal found not far from it, very much rusted, all the articles in the mould, or in the disturbed soil, consisted of flint, chert, sienite, and bone,—such primitive substances as have been in all countries, and down to the present, used by the savage for the fabrication of his weapons, whether for the chace or battle.

At a still greater depth, near the common entrance, in the passage, lay extended lengthwise, in the ordinary position of burial, the remains of a human skeleton, much decayed—two portions only of the jaw and some single teeth, with the mouldering vertebræ and ribs, were all that remained. As in the case of the flint knife mass, already described, there adhered to the jaw portions of the soil on which it lay, and of the stalagmite which partly covered it.

The teeth were so worn down that the flat crowns of the incisors might be mistaken for molars\*—indicating the advanced age of the indi-

\*In the original notes, from which the Memoir appears to have been compiled, the condition of this skeleton is thus described:—"Its teeth, most of which I collected, are with one exception sound and undiscoloured,—that they belonged to a robust adult they and the fragments of the skull and vertebrae abundantly testify.—The front or incisor teeth are what are called *double teeth*." In a paper read at the meeting of the British Association in Edinburgh by Mr. Daniel Wilson, Sec. F.S.A., Scot., "on the evidence of the existence of primitive races in Scotland prior to the Celtic," the following remarks occur "one characteristic feature in the skulls of various tumuli is the state of the teeth. It is rare to find among them any symptoms of irregularity or decay. In a tumular cemetery at North Berwick, however, the teeth of the skulls, though sound, were worn in most cases completely flat, like those of a ruminating animal. Dr. Thurnham remarks the same to have been the case with the teeth in those found in the Anglo-Saxon cemetery at Lamelhill, and it is also observable in an under-jaw found along with other remains of a human skull, an iron hatchet and several large boar's tusks in a deep excavation on the south bank of the Castle Hill, Edinburgh \* \* As a means of comparison this characteristic appearance of the teeth manifestly furnishes one means of discriminating between an early, and still earlier, if not primæval, period. \* \* We perceive from it at least that a very decided change took place in the common food of the country from the period when the native Britain of the primæval period pursued the chase with the flint lance and arrow and the spear of deer's horn, to the comparatively recent period, when the Saxon marauders began to effect settlements and build houses on the scenes where they had ravaged the villages of the older British natives." At the meeting of the British Association at Cheltenham, in 1856, in the discussion which followed a paper which I read on this subject it was stated that several tribes in the Malay Archipelago have a custom of filing down the front teeth of boys on their attaining the age of manhood. The practice is connected with superstitious observances, which prevailed amongst the primitive tribes in this country, denominated Phythians, or Allophyllians, the pre-celtic immigration, which is supposed by Pritchard, in his *Natural History of Man*, to have come from the East.

The following is an extract from a letter which I subsequently received from Mr. Wilson:—

"So far as I have yet seen, the crowns of the teeth are generally very slightly worn in the crania found in the Scottish tumuli, and in no case do they at all resemble the flattened state of those to which I referred as found, accompanied with Anglo-Saxon relics, at North Berwick, East Lothian. There can be little hesitation, I think, in accepting this as an evidence of some very decided change having taken place in the food of the country between the era of the Primitive tumuli, and that of the Anglo-Saxon tumular barrows.

"Any hard, dry, gritty food, would have produced the effect, as is proved by the same results being found to take place in the modern English sailor, from the constant use of dry, hard biscuit. At the period of the early tumuli, the population appears to have been thin, and the country much wooded. The spoils of the chase would supply the principal food, possibly, sheep, or goats were kept, and milk added to the animal food. But we have neither evidence nor probability in favour of any extensive practice of Agriculture. It was altogether different in the Anglo-Saxon period. The population was considerable, and gathered together in towns or villages; a marked division of ranks existed, and it is consistent with all we know of them, that the plebeian class lived chiefly on barley bread, (e. g. the well known tale of Alfred and the neatherd's cakes), pulse, &c. Dentists will tell you that nothing grinds down the teeth more effectually than our modern luxury of toasted bread. But this is counteracted by the accompanying tea and other liquids, which, also, from their being used at so high a temperature, contribute not a little to the modern necessity for the dentist. The tumuli supply abundant evidence that tooth-ache is one of the *luxuries* of modern civilization.

"The same cause which produced the flat and worn condition of the molars, would act, I conceive, in like manner on the incisors, as in the example you refer to. But the front teeth, you are aware, more readily fall out of the jaw, and are much more rarely met with in tumular crania than the others.

"I would have little hesitation in assuming that the human skeleton, described by Mr. MacEnery as found in Kent's Cavern, belonged to a comparatively recent period,

vidual. M. Cuvier, to whom I submitted the fragment, in 1831, was struck with the form of the jaw. He pronounced it to belong to the Caucasian race. He promised to bestow particular notice on it, but death, unhappily for science, put a stop to his glorious labours. All the specimens, together with a collection of fossil bones,—the third I had presented to the museum of the Jardin des Plantes, I transmitted to him before I quitted the continent—and may be found among his effects. The skeleton lay about a foot and a half below the surface,—from the tumbled state of the earth, the admixture of flags of stalagmite, added to the presence of flint articles and pieces of slate, it was manifest that the floor had been dug up for the reception of the body, and that it was again covered over with the materials thrown up from the excavation. The earthy covering consisted of the red soil, containing fossil bones mixed up with recent mould,—the mound of earth outside the mouth, at the right hand, was thrown up from the passage to render it more accessible. It was precisely that which covered the human skeleton, and contained the admixture of human and fossil relics.

Previous to the disturbance of the floor for the admission of the body, it would appear, from the presence of flags of stalagmite in the rubble, that it was covered with a continuous crust,—the edges indeed of which still adhere to the sides. It further appears from the repetition of similar crusts, as indicated by the broken edges at the sides, that there were periods of repose which allowed new floors to form, marking clearly their repeated destruction and renovation at intervals of time.

With the exception of single teeth, and an occasional rib or vertebra in charcoal, which may have possibly belonged to the same subject, there were no other traces of human remains.

certainly to one long posterior to the implements of bone and flint found alongside of it. The apparent depth at which it was found, the mode of interment—extended at full length,—and the locality itself, all militate against the idea of primitive sepulchral rites. It might, of course, be an exception to general rules, and yet belong to the early period, but in that case, all inductive reasoning fails us, according to Archaeological evidence. This, however, seems apparent, that the primitive implements of silica, sienite, bone, &c., belonged to strata that were disturbed, and cut through in depositing the body,—and, if so, the period of their economic use had then passed away, or they would not have been reinterred.

“I should perhaps add, that in speaking of the skeleton as comparatively modern, I should consider the Anglo-Saxon period as properly coming within such a term. I hope to establish the fact that a primitive human population existed here at a very remote period.

“I am now preparing a work for the press, on Scottish Archaeology, which I hope to publish in the autumn. I shall state my views, there, more at length in regard to the primitive British races. If you know of any collection of Crania from British tumuli you would confer a great favor by informing me of them.”—E. V.



## STALACTITE AND STALAGMITE.

As we advanced towards the end of the passage we found a floor of stalagmite. It may be expected by a portion of our readers that we should say something of its manner of forming.

The concretions of Caverns and fissures are derived from the solution of the softer portions of the limestone by the action of water, impregnated with carbonic acid,—the substance so formed is designated Stalactite, as it may happen to be appended to the roof, and Stalagmite when attached to the floor. Its manner of forming is by the percolation of water through the rents or pores of the rock, which, as soon as it comes in contact with the air, disengages the acid, and allows the calcareous matter collected in its passage, and which it held in solution, to crystalize. The sediment thus precipitated assumes an infinity of forms, grotesque or graceful, according to the caprice of nature, inexhaustible in her forms as in her means. From this slow but constant source spring those natural embellishments common to all limestone cavities, and bearing in all nearly similar forms and names, such as lustres and chandeliers, cascades and fountains, altars, fonts and pyramids.

This Cavern, though in sparry concretions it may be surpassed by others in the country, is not destitute of the usual complement of these natural ornaments—the effect of which, when the Cavern is illuminated, is much enhanced by the reddish tinge (communicated by the ferruginous veins through which the drop is filtered in its progress through the rock) which curiously streaks the alabaster surface of the sides, giving them the air of being hung with tapestry.

Though unwilling to dwell longer on this subject, we shall not be pardoned if we pass unnoticed the Stalactites in the upper gallery and vestibule. Immediately under the drops or “chandeliers” in the latter hall stood corresponding cones on the floor, both were occasionally united by slender columns or tubes, through which the calcareous matter flowed downward, which had the effect of supporting the vault.

In the upper gallery the fluid formed at the roof clusters of cones, disposed at regular intervals, like the pendants of a Gothic screen, connected together by a transparent curtain of stalactite.

It is not, however, for their picturesque forms that these concretions merit notice, but for the service they have rendered in sealing down the floor, hermetically, and preserving its deposits sacred through long periods of time from disturbance and decay.

The infiltration, after dropping on the point of its respective cone, and insensibly augmenting it with its sediment, flowed down the sides of the mound, and, spreading round its base, formed zone after zone, "like circles in the water," until in its progress it was met by the concentric rings of adjacent cones, similarly forming and advancing. In this way was the whole surrounding space gradually invaded and covered with a continuous sheet of stalagmite, consisting of a multitude of concentric circles, the borders of which thinned away in proportion as they receded from their centre or nucleus, which was often as many feet thick as their skirts were inches. It was thus the crust was formed in the retired parts of the Cavern, such as the Bear's den, and in the cave of inscriptions and the Wolf's passage.

The block in the cave of inscriptions, bearing the superscription of 1688, is not a bad example,—and in the excavated blocks of the same chamber, strewed about, may be observed aggregations of these rings as described.

In other parts, as near the common entrance, the calcareous moisture entered laterally through the clefts and crevices, and spread slowly over the floor. Its section exhibits alternate layers of red and white, marking successive periods of rain and fair weather.

#### COMMON PASSAGE AND VOMITORY, TUNNELS, AND SALLYPORTS.

In detailing the circumstances attending the discovery of the human skeleton we have described the condition of the passage.

The floor in the chamber in which it terminates partakes of the disturbance we had to remark at its commencement, with this difference, that the stalagmite in the passage was pierced through for the inhumation of a human body,—here it was left intact, but covered with mould during the successive stages of its formation which was subsequently encrusted over, when the cavern was deserted, and the drop was allowed to resume its process of incrustation. The floor, in consequence, presents the anomaly of repeated parallel layers, between which rubble was interposed containing flint blades. These events were by no means continuous, and occur only where extraneous matter was introduced on the occasion of the visits of savages to the cavern,—or of the passage of animals which made it their thoroughfare. The fossil bones at this part differed in their degree of preservation from those in the rest of the cavern, being lighter, much discolored, and mouldering as if from long exposure. My collection exhibits several instances.

From this chamber shoot off to the right two oven-like recesses in the side of the rock, terminating in a *cul de sac*, but which, there is little doubt, before the growth of the incrustations, opened externally,—they are long, broad, and high,—the floor is covered with an accumulation of soft mould of several feet deep, containing only recent bones and fibres of trees which had struck in their roots through the crevices, many of them of the thickness of the wrist.—A third shoot, facing the mouth, is elevated above the ground and once conducted into a lower range of caverns, of which we shall have occasion to speak under the title of the “cave of Rodentia;”—when working below we communicated with the persons above by means of this arm. It is floored with stalagmite.

We shall now proceed by the “passage of urns” (such, for distinction sake, we may call it) into the Upper Gallery. It is formed of a succession of vaulted chambers, unfolding progressively into each other, preserving nearly the same elevation, breadth, and level, with a downward tendency towards the end, where it is closed by the rock so curiously encrusted as to receive from Mr. Northmore the appellation of the “Altar of sacrifice;” about the middle it is dimly lighted by the “vaulted mouth” which opens into it, and with which it runs parallel.

The floor of this gallery is so encumbered with fallen masses, some of them of several tons weight, that, except in vacant spaces between them, it is difficult to reach the bottom. Many of these ledges are impacted in the stalagmite, or having fallen aslope intercepted and accumulated the calcareous dropping on the surfaces, leaving the soil beneath unencrusted. After various attempts we succeeded in opening an excavation about half-way down this branch, below the mouth. Owing to the cause just stated we found the floor very irregular,—consisting of masses imbedded in the stalagmite, or of an aggregation of loose stones cemented together by the same substance. In this breccia we found articles of flint, and in one instance a fragment of pottery, but what struck us as most singular was a layer of reddish marl, which overspread the stalagmite in this part;—our surprise was still greater when in searching for pottery and the other articles already mentioned as occurring here, we fell in with fossil teeth in the same bed. We were at a loss to divine its source, when, in proceeding with our operations below the stalagmite, the mystery cleared up—we found to our amazement that the entire region beneath was traversed in all directions by sewer-like tunnels, sufficiently large and extensive to permit a man to range in a creeping posture through the bottom of the cavern.

A regular system of subterranean passages was excavated in the soil,

the main trunk of which runs conformably to the length of the gallery, throwing off numerous branches to the right and left.—I have penetrated several times more than fifty feet up the main arm, much incommoded of course by the crumbling of earth from the roof,—occasionally jammed up too by the projection of rocks from its sides, or straitened by the contraction of the passage. On one occasion the soil yielded under me several feet and I sank down with it, to the great horror of my companions behind me in the passage, who expected to be ingulphed. The earth escaped into a vertical cavity in the floor, of which we subsequently availed ourselves for discharging the excavated soil. I was nothing daunted, however, and renewed my attempt to come out at the opposite side of the cave, into which it seemed to open, in the hope of thus discovering a new inlet for the mud. I had only gone about a hundred paces, when, owing it is supposed to foul air, my light was extinguished, and I was deprived of my senses, my friends supposed me lost and despaired of drawing me out. I was however extricated by my faithful fellow-laborer Walsh, to whom I am indebted for my life. I suffered for some weeks from the imprudence, and it was some time before I was able to re-visit the cavern. Since the passage has been ventilated, the same danger may not exist.

### TUNNELS.

The spectacle presented by these tunnels, for such they are on a small scale, was almost worth the risk.—Scattered along the floor lay the recent jaws of sheep, deer, &c., while projecting from the floor and sides appeared the remains of some twenty species of quadrupeds. The roof, too, exhibited the appearance of being studded with teeth and jaws, which occasionally protruded forwards. The effect was still more striking where the soil, become dry and mouldering from exposure, parted from the fossils, leaving them quite bare, attached to the stalagmite overhead.

In these tunnels were discovered the entire under jaw or lip of the Hyena, and the perfect jaw of a young animal of the same species.

It was remarked that though a large proportion of the bones were broken and gnawed, they were certainly less so than in the central chamber.

The reader will have anticipated me in referring the loose marl on the upper surface to these tunnels. It was thrown up by the animals which burrowed through the subterranean soil; they took advantage of the uncovered parts which were screened from the drop by the

overlapping of fallen masses, to penetrate through into the body of the Cavern from their excavations below. It will also be conjectured that it was from a similar source that the earth was thrown up which furnished my first discoveries near the other mouth, and which were the occasion of my undertaking the examination of the cavern.

Before we quit this division of the cave we must notice

### THE SALLYPORTS.

They are so called from their resemblance to such covered outlets in forts. They pierce the side of the rock of the upper gallery below the vaulted mouth,—and though it has not yet been ascertained if they open through the side of the hill, there is strong presumption that they do so. Their surface is covered for many feet, like the offshoots near the other entrance, with an accumulation of soft mould ; but here it is mixed up with red marl, and contains fossils confounded promiscuously with recent bones.

They are so honeycombed by the operations of burrowing animals that the earth yields to the slightest pressure. It went down so far with one of our party that he called out for help, fearing that he was going to be swallowed up with the earth into the abyss into which it was escaping. Certainly on one occasion we heard heavy masses followed by earth roll down into lower gulpha, of the existence of which there is evidence in the lower division of the cave. Our party was so frightened by the incident that some more adventurous than the rest were compelled to yield to their instances, and not to push their researches in quest of other entrances further in this direction.—It seems most probable that it was through these that the burrowing animals penetrated from the outside into the body of the Diluvium.

The mould along their whole length abounds with the scales of Beetles, supposed to be the faecal deposits of the Fox,—from the presence of which and other indications, such as scratches on the newly tumbled earth—there is reason to believe that it was this animal which made the perforations in the floor. The base of the hill has been long known as a cover for foxes. Sir H. Carew has often earthed them here,—and more than once we have heard them as if in the act of escaping, as we pursued our excavation. So constant has been the disturbance of the floor, notwithstanding the copious distillation of calcareous matter by the roof and sides, that it was never allowed to attain any consistency.

## THE ARCADE, CAVE OF INSCRIPTIONS, LABYRINTH, AND OVEN.

We have now to retrace our steps and proceed down the sloping chamber, from which we shall turn off, on the left, into the arcade or corridor, which conducts into the cave of Inscriptions, and the Bear's grotto. The floor at the corridor was in great disorder, strewn with rocks, the spaces between which were formed into natural reservoirs of water. The arcade goes on progressively diminishing until it opens into the cave of Inscriptions. About half way up, the passage lies over steps cut in the stalagmite, and the floor maintains the same level for the rest of the way, until it opens into the spacious hall at its termination, which, from the number and antiquity of its Inscriptions, deserves to be distinguished accordingly.\* But the floor at the entrance of the arcade is an exception to the disorder. It is free from adventitious substances, having been protected by the projection of the left wing of the vestibule from their admixture during the formation of the stalag-

\*In the original notes the following passage occurs in reference to these Inscriptions:—

"Innumerable inscriptions, crowded one upon the other, are engraved upon the vaulting and floor of the stalagmite. They are in divers characters—Greek, Roman, and German—embellished frequently with grotesque devices. They may be traced through the last three centuries at least, and exhibit curious examples of the insensible progress of incrustation. In some only a letter or syllable, in others the entire inscription is glazed over by a transparent membrane, through which it is still legible, the fluid having followed and partially filled up the indentations of the characters, but not totally disguised them. In other specimens a letter or a word is overlaid by a thick film, and quite obliterated, the remaining members having escaped by lying out of the current. Where the droppings precipitate into a soft cellular deposit the inscriptions soon recede before its rapid advances. This is the case in the grotto near the common entrance, and in the screen at the opening of the superior division. In the Arcade the coating of the walls exhibits the firmness and polish of marble, and being slowly invested retains longer the impressions committed to it. The same remark is applicable to the Cul de sac, to which it directly conducts.

"In the lobby there occur dates from 1624 to 1782. \* \* At the entrance of the Arcade there is a Greek inscription. \* \* Along the line of the Arcade there are numerous names and dates distinctly visible. \* \* In the front wall of the Cul de sac we read—'Peter Lamaine, Richard Cally, of London, 1615.' 'John Martyn, 1617.' In German characters—'Ambrose Lane, Mildred, Torkington,' accompanied with the device of a dome surmounted by a cross. On a huge cone of stalagmite, on the right of the entrance to this chamber, there is a remarkable entry—'Robt. Hodges, of Ireland, Feb. 20, 1688.' The letters are glazed over and partly effaced.

"The Chancellor Bacon is recorded among those who visited this Cavern, but upon what authority it is asserted I cannot ascertain. The circumstance is not mentioned in his works. There is little doubt that the cave contains records anterior to those enumerated, though they have ceased to be visible, or rather difficult to be deciphered. The indistinct traces still remain. From the vicinity of Tor Abbey, which was founded in the reign of John, and its more adjacent dependency of Lisam, it is probable that the cave was visited by their inmates."

Where the asterisks are inserted spaces are left in the manuscript for the inscriptions which were not supplied. They are now defaced and illegible.—E. V.

mite. It is a spongy tufa—not deposited like the rest in alternate layers of various depth and tint—but simply a pure white homogeneous granular deposit of calcareous matter. Half way down it was divided horizontally by a blackish seam a couple of inches thick—extending about a yard in circumference. The stratum consisted of charcoal mixed with decomposed animal and vegetable matter, from the midst of which were extracted two portions of the jaw, a tusk, and some of the phalanges of a Boar. The animal remains acquired their color perhaps from their long residence in the charcoal, which appears from the burnt state of the bones to have been employed in roasting them. The lower half of the stalagmite was, like the upper, devoid of all extraneous matter.

The soil beneath it we shall describe when we come to treat of the vestibule, of which this wing is only a continuation. We shall merely remark that the earth was freer, not only from bones, but also from rocky fragments, than the central chamber—being screened from their accession from the upper levels by the same cause which guarded the stalagmite, the gravel was the same, however, and the bones, though more sparing, equally characterized. We shall not stop at present to state the reflections suggested by the singular fact we have just noticed, but continue our route in the arcade.

It has been remarked that the floor was divided between masses of rock and pools of water—the latter were encircled with many walls rivalling the most exquisite works in pastry, formed by the drop as it fell into these basins impelling the spray to the edges. Between the rocks and overspreading the stalagmite appeared loose heaps of red marl containing fossil bones. In this loose heap it was that I found the first Rhinoceros tooth, which I presented to a lady at Torquay who had a collection of objects of natural history from the environs.—I had not yet commenced forming my own collection.

It was merely a repetition of the phenomena of the upper chamber and referable to the same cause. But what was peculiar to this passage was a profusion of a white crumbling substance not unlike half-slacked lime. Rock after rock, as we turned them over, presented patches of it on their surface—the loose mud contained it likewise—and wherever stalagmite had formed between the rocks, when ripped up it exhibited large deposits of the same matter. In the crevices of the rock and near the surface of the marl we discovered it in balls partly crushed,—and as we proceeded, collections of them imbedded in the mud, which left no doubt of their nature and origin.

In some instances, several of them were pressed together in others

they occurred singly, coated over with a pellicle of stalagmite or thin slime.

This passage was, in consequence, appropriately called by Dr. Buckland, to whom I pointed out the accumulation, the *Hyena cloaca maxima*.

### 3 CAVE OF INSCRIPTIONS.

The observations that have been made on the arcade are applicable to this chamber,—of which it is indeed only the continuation and boundary,—the same irregularity of floor—the same abundance of *album vetus*,—but there are certain characters peculiar to it and the Bear's den, which distinguish them from the rest of the cavern. First—The predominance of one particular species which commences in the arcade, to the exclusion almost of the rest. Secondly—The dislocation of the stalagmitic floor, and the depression of the level of the mud, the cause of it.

The floor exhibited the greatest confusion—the stalagmite was broken and thrown on its edges and the red marl left partly exposed. In this position was found by Mr. Welland the lip of an enormous Bear. I also found, under the same circumstances, a considerable number of the remains of the same animal in different stages of preservation. Some of the specimens were discolored by the contact of charcoal, used for fires. Here were found clusters of tubes or icicles in hollows. The change of level is best observed at the sides. The soil may be seen separated by a considerable space from its former crust, which continues in some places to maintain its position, spreading above the space like a mantle.

An interesting example on a small scale is what is termed "the saddle;" on the right of this chamber, under the wall—in a piece of stalagmite which took the undulating form of the earth on which it moulded itself, and which it retains notwithstanding the separation of the soil.

Before the subsidence the soil rose to the height and touched the base of the curtain of rock, below which it has fallen so considerably as to permit a person's ranging through it on his face. Its former height is indicated on the rock, not unlike a water mark.

### LABYRINTH, BEAR'S DEN, AND WOLF'S PASSAGE.

The passage leading from the arcade into the Bear's den is by far the wildest part of the cavern; the path lies over rugged ledges, and through intricate windings, the rock descending half way down in



inverted pinnacles, beneath which it is necessary to tread with caution, —more than one has carried home contusions to remind him of the rocky labyrinth—which, without a figure, it may be called.

There was a tradition of the loss of life here by a young man who ventured to explore it without a guide. It is certain that two gentlemen who had lost their lights and way spent a night of horror there. Dreading to advance for fear of falling into the pits, of which we shall have to speak, they remained immoveable until their friends came to their relief, alarmed by their absence.

Nowhere in the cavern does the rock show itself, as here, in such quaint and mouldering masses, through which calcareous veins and organic remains protrude in relief. The softer portions being eaten away by age and moisture, they are pierced through with holes, and seem to threaten to sink under the weight of the vault. In the other parts the stalactites have glazed over the surface, and defended it from decay. In this it was left naked.

Here again the soil (that is the red marl) was scattered over the rock and stalagmite, much tumbled. In it were detected the remains principally of bear—discolored and decayed. The stalagmite was very irregular. Where it covered the red marl it disclosed the remains of bear, exclusively, in the highest and most brilliant preservation, almost surpassing in freshness and lustre all I have ever seen of modern bones.

### BEAR'S DEN.

A curtain of stalactite, with depending clusters of spar at certain intervals, and corresponding eminences on the floor, was the picture this chamber presented when we first saw it. It was floored through its entire extent with a continuous sheet of stalagmite, siliceocalcareous and crystalline, so difficult to penetrate that after repeated attempts we abandoned it in despair,—at length availing ourselves of cracks that traversed it, like the divisions in a pavement, we succeeded in ripping it up. All we had hitherto observed vanished in interest before this disclosure.

The first flag that was turned over exhibited, in relief, groups of skulls and bones adhering to the stalagmite. Each successive flag repeated the same spectacle. It is to be regretted that their size prevented us from transferring them at once, as they were found, to our museums—for while they lay in the chamber awaiting their removal, some persons, who had heard of the discovery, broke into the cavern, and either tore away or disfigured the masses. Sufficient, however, have been pre-

served to give an idea of the accumulation and character of the remains in this quarter.

So highly crystalized was the calcareous matter mixed with sand (which came down during rains) that it struck fire with the pickaxe ;—as we penetrated into the marly deposit, we found it indurated by the infiltration of the same matter, and thickly impregnated with the oxyde of iron. It was necessary to break it off by piecemeal,—the bones, in consequence, seemed to be mineralized,—they were double the weight of those in the other chambers, were brittle, and broke sharply off like petrified substances,—we found this was owing to their cavities being filled with crystals, and their pores penetrated with the oxyde of iron. The essential nature of the bones was not altered, as we afterwards ascertained.—In none of the chambers has the stalagmite been so highly crystallized and the fossil remains in such brilliant preservation, —when struck they ring like metallic substances.

The remains of Bear prevail here to the exclusion of all others—of all ages—and of all periods, down to their encasement in the mud,—some of the teeth have the most dazzling enamel, and the bones retain their natural freshness, as if derived from animals in high health destroyed for the sake of their skeletons ; others on the contrary are of a darkish brown, with the texture of the bone decayed from long exposure, and only kept together by the calcareous and ferruginous matter with which they are saturated—even the enamel is of a greenish tinge. Owing to the induration of their earthy enclosure or their incrustation by stalagmite, few were extracted entire. Two skulls were buried in the stalagmite as in a mould, and were brought away in that state. The spar has formed into a variety of spicular crystals in their chambers.

The skulls were severed in two, the front being separated from the occiput and found apart,—the other portions of the skeletons lay about in all directions without any order, generally, though we were able to trace the natural relation of the parts in some instances.

But in no case were they or the skulls broken or gnawed like those in other parts. The long bones were found generally entire, and when found broken, it was only mechanically, from pressure.

In no instance have they exhibited indications of being broken or gnawed by the jaws of carnivorous animals for the sake of their flesh or marrow. In fine, they were precisely in the state of bones that belonged to animals that died by a natural death, on the spot, during a succession of ages, whose remains had long lain about on the surface, subject to being trampled upon by the feet of their own species that made this branch their haunt.

In this respect this section of the cavern resembles the caves of Germany in the predominance of the Bear, in the identity of the species, and in the unbroken condition of its remains. It is worthy of remark that the remains of the *Ursus cultridens* do not appear here any more than among the Bears in the German caves, though they do, as we shall see, in the other chambers, with bones of Elephants.

To enhance the wonder of this anomalous scene, there appeared, and there still exist attached to the under surface of one of the pyramidal mounds in this chamber, lumps of *album græcum*,—but of other traces of the presence of the Hyena there is not a shadow, nor indeed of any other animal—except in its outskirts—as shown by the fractured jaws of *Ursus spelæus* and *cultridens*. In the German caves we know that the remains of the Hyena generally accompany those of the Bear,—under such circumstances too, as to warrant the inference that certain species at least, if not all, lived in good intelligence together.

In the centre of this chamber there was a double floor of stalagmite, —between which was interposed a stratum of rubble, sparry pipes, a black flint knife, and spots of charcoal, with shells of muscle and oyster, but no red marl—or its usual contents.

The rest of the floor was regularly stratified in red and white laminæ, exhibiting no vestiges of adventitious matter—or of interruption.

The position of this rubbly stratum occurring half way down the section of the stalagmite, inclines me to refer it to the same cause and epoch as the seam containing the Boar's remains, at the entrance of the arcade, of which we have already spoken.

#### SUBSIDENCE OF MARL,—CHANGE OF LEVEL OF THE CONTENTS OF THE BASIN.

The interest of this region is not yet exhausted. Mention has been made of pits on the floor, into which certain bewildered visitors were in apprehension of falling. They are situated to the right beyond the Bear's Den.

Hooking on to the sides with hands and feet, you alight into a second cave, below that which you had been exploring, and of the existence of which you had no suspicion, while walking securely on the surface.

There are two and in some parts even three underground stories through which it is possible to range.

In some places the space is sufficiently lofty to permit standing upright,—but towards the verge it contracts, obliging the explorer to creep along flat on his face.

It spreads co-extensively with the upper cave, and even stretches far beyond its limits under the actual wall, which only drops half way down like a curtain, expanding with the base of the hill or its rocky shell.

In this second substalagmitic range occur phenomena that are calculated to lead the inexperienced to false conclusions. Above his head appear bones adhering to the roof,—under his feet they protrude from the floor or lie scattered loosely over its surface. From these startling facts he might be tempted to infer the existence of at least two distinct deposits, but upon closer observation the difficulty will vanish, as patches of stalagmite may be observed, at certain intervals, adhering to the floor,—which were torn from the roof above, and which caused the cavities in the upper level that gave him access to this region,—he will further remark the absence of continuous crust beneath, and coupling the appearances of the floor with those of the roof, he will perceive that the intermediate space was created simply by the separation of the earth from its covering, in consequence of a change of level in the former, on a grander scale than in the cave of Inscriptions.

The change of level is confined to the region on the right and left of the arcade. It does not extend to the vestibule or upper gallery, where the labors of burrowing animals as effectually excavated spaces of nearly equal extent and depth.

The displacement of such an enormous mass supposes the existence of still lower gulphs, into which it sank, from the failure of its support, or from the sapping of its foundations by the action of subterranean currents, and its consequent subsidence into the void so created.

Appearances seem to favour the first supposition. From the fracture of the crust and the general depression of the red marl it would seem that the depression was simultaneous and sudden, arising from the giving way of the rocky ledges on which it rested.

But whether it is to be attributed to this cause or the action of currents, or the excavations of burrowing animals (of the presence of which there is no evidence), certain it is that lower cavities exist for the reception of the deposit, which enlarges our ideas of the vastness of the cavern.

Before we take final leave of this strange scene, we should not omit to notice the basin of water beyond it on the left, about which speculation has been so busy, whether a natural spring, or merely derived from copious infiltrations during rainy seasons, which seems its most probable source,—for in winter all the hollows are filled with water; it seems not at all probable that it was the work of man,—whether savage

hunter or Druidical Priest—but simply a natural reservoir of the accumulated droppings.

The cave beyond it deserves no particular notice—Admiral Sartorius and others have swam across.

#### WOLF'S PASSAGE.

We now propose passing to the opposite extremity of the cavern, or right wing of the vestibule. The roof and floor nearly meet at this point, which was always regarded as the extreme limit of the cavern. By removing heaps of loose stones and mould with which it was choked up, we unexpectedly opened a passage to a small group of chambers, that mortal foot seemed never before to have penetrated into. The passage cleared of rubble, we set to work at the removal of a column of spar which joined the ceiling and floor, and obstructed the way into the suite beyond. After great labour we succeeded in dislodging it, when to our inexpressible surprise and joy we found it had covered the head of a wolf,—perhaps the largest and finest skull, whether fossil or modern, of that animal in the world,—near it lay one of its under-jaws entire,—the other, notwithstanding the most diligent search, we failed in recovering. This obstacle removed, we burned with impatience to penetrate into the chambers beyond.—As a Grotto, hung with curious concretions of dazzling brilliancy, it well repaid our search. The floor sloped upwards and conducted into two oven-shaped branches, which it threw off to the right and the left,—similar to those near the common entrance, and with which the one on the right seemed to communicate, though partly closed up at present by stalactites; that on the left seemed to pierce through the boundary wall of the cavern into the open air.

We now returned to the excavation which produced the wolf's head. The stalagmite was about a foot and a half thick and of excessive hardness, in which were embedded rocky fragments rolled down the slope, but as we advanced inwards the stalagmite became altogether free from foreign admixture, and moulded itself upon the mass of bones. Of the quantity and condition of the remains here it is scarcely possible to give a just idea without appearing to exaggerate. They were so thickly packed together, that to avoid injuring them, we were obliged to lay aside the picks and to grub them out with our fingers. They had suffered considerably from pressure after having first undergone violence from the force which impelled and congregated them in this narrow neck. They were found driven into the interstices of the opposite wall

or piled in the greatest confusion against its side, with but a scanty covering of soil, and that of the finest, softest sand intermixed with greasy earth. To enumerate the amount of fossils collected from this spot would be to give the inventory of half my collection—comprising *all* the Genera and their species, including the *Cultridens*\*—there were hoards,—but I must specify jaws of the Elephant and tusks, with the teeth in the sockets, the bone of which was so bruised that it fell to powder in our endeavour to extract it,—a rare instance of the teeth occurring in the jaws or gums. The same may be observed of the jaws of the Rhinoceros, one portion alone of which was saved; but the teeth of both were numerous and entire. The jaws of the Elk, Horse, and Hyena, were taken out whole. The teeth of the two last were gathered in thousands,—and in the midst of all were myriads of

\* “In this island anterior to the deposition of the drift, there was associated with the great extinct Tiger, Bear, and Hyena of the caves, in the destructive task of controlling the numbers of the richly developed order of the herbivorous Mammalia a feline animal as large as the Tiger, and, to judge by its implements of destruction, of greater ferocity.

“In this extinct animal, as in the *Machairodus cultridens* of the Val d’Arno, and the *Mach. Megantereon* of Auvergne, the canines curved backwards, in form like a pruning-knife having the greater part of the compressed crown provided with a double-cutting edge of serrated enamel; that on the concave margin being continued to the base; the convex margin becoming thicker there, like the back of a knife, to give strength; and the power of the tooth being further increased by the expansion of its sides. Thus, as in the *Megalosaurus*, each movement of the jaw with a tooth thus formed combined the power of the knife and saw; whilst the apex, in making the first incision, acted like the two-edged point of a sabre. The backward curvature of the full grown teeth enabled them to retain, like barbs, the prey whose quivering flesh they penetrated. Three of these canine teeth of one of which a side-view and a view looking upon the concave edge (fig. 69) are subjoined, were discovered by the Rev. Mr. McEnery, in Kent’s Hole.

\* \* The cast of the largest of the canines of the *Mach. cultridens* from the Val d’Arno presented to me by Mr. Pentland, measures eight inches and a half in length, along the anterior curve, and one inch and a half in breadth at the base of the crown. The largest of the canines of the *Machairodus* from Kent’s Hole measures six inches along the anterior curve, and one inch two lines across the base of the crown: the English specimens are also thinner or more compressed in proportion to their breadth, especially at the anterior part of the crown, which is sharper than in the *Mach. cultridens*.

“These differences are so constant and well-marked as to establish the specific distinctness of the large British sabre-toothed Feline animal, for which therefore I propose the name of *Machairodus latidens*.

“By comparison of the teeth of the fossil Hyena with those of recent animals,” says Mr. Stutchbury, “their enormous size was strikingly shewn; those from the Hyena proved it to have been larger than the largest known species of tiger. The skull from Kent’s Hole measures fourteen inches in total length, and exhibits the dental characters and the strong intermuscular ridges of the formidable spelæan Hyena in great perfection.” (Owen, p. 156.) In the Torquay Museum there is a skull of this animal twelve inches long, and a collection of teeth, several of which must have belonged to specimens of even larger dimensions.

“An idea of the formidable size which the old males of the *Ursus spelæus* attained in this country may be estimated by the upper canine tooth from the cave at Kirkdale, figured by Dr. Buckland, and the one here figured from Kent’s Hole, Torquay. It matches the canine teeth of the largest of the Continental specimens of the *Ursus spelæus* the size of which extinct Bear, Cuvier says, must have equalled that of a large horse.” (Owen’s Fossil Mammalia, p. 90.) In the Torquay Museum there is a specimen measuring  $5\frac{1}{2}$  inches in length.—E. V.

Rodentia. The earth as may be expected was saturated with animal matter—it was, to use the expressive words of my fellow-labourer, Walsh, fat with the sinews and marrow of more wild beasts than would have peopled all the menageries in the world.

#### CAVE OF RODENTIA.

We literally drove a passage through piles of bones in our progress to the inner grotto. There, again, a new spectacle opened to us—no longer, or but rarely, had we to do with great quadrupeds,—these we left at the entrance ;—we now found ourselves in the midst of myriads of Rodentia. Of their remains and dust the deposit was constituted, agglutinated together by calcareous matter into a bony breccia.

It should have been premised that the stalagmite above them was about a foot and a half deep, regularly laminated, and free from all adventitious matter—being a solid concretion of lime, scarcely yielding in hardness to that in the Bear's cave. Since it first commenced it had suffered no disturbance or interruption ;—the floor and ceiling announced a grotto in its virgin state, that had been closed against all intrusion since the deposition of its materials.

The remains of Rodentia were wanting in no part of the cavern that we had yet examined. They were generally observed near the surface of the red marl,—(I do not of course speak of the recent skeletons of Rat and Bat found in the cavities of the crust,)—but here, in this grotto, they swarmed in countless multitudes,—not only had their tiny remains penetrated into every cleft and crevice of the rock, but they insinuated themselves even into the chambers of the large bones. The Wolf's skull in the passage had its cavities charged and its surface encrusted over with a concretion of their bones. When first I contemplated this congregation of minute skeletons, I was prompted to suppose them to be the spoils of animals that had been overtaken by the calamity, from which they rushed into this grotto for an asylum. Nor is it unlikely, that at the moment of the irruption of the mud, thousands had so perished,—but it was not of animals destroyed by a sudden catastrophe that this heap is made up. Before they were injected into the fissures of the rock and chambers of the bones they must have been already divested of flesh. They lay loose and disentangled at the instant that the fluid caught them up and washed them into situations where they could have never penetrated without its agency. Evidence of this is found in the fine sandy sediment which entered with and enveloped them in their new abode.

That they existed and died here is still further confirmed by the condition of their remains,—they are indicative of all ages, and stages of preservation, still furnished with their most delicate and fragile spinusses, announcing successive generations which died here peaceably in the course of nature, during prolonged habitation of this grotto by their race. Add to which the marks of small teeth on the large bones accumulated at the entrance—the generality of which were scratched transversely as with the edge of a file,—there cannot exist a doubt that these impressions were made by small quadrupeds which feasted on offal rejected by beasts of prey.

Had they been washed in with the mud, it must have been either with their carcases entire or dispoiled of their flesh.

In the former supposition they could not have entered into the narrow and intricate recesses of the large bones,—and in the latter, instead of occurring congregated into a mass in a particular spot, their loose bones would have been equally diffused throughout the cavern.

It was an interesting spectacle to behold myriads of minute animal remains congregated by the side of Elephants, Rhinoceros, and Hyenas, in a common sepulchre. When a handful of this dust was thrown into water, hundreds of teeth rose to the surface; and it was by this means they were collected.

In this heap were found intermingled the remains of the land and water Rat (or campagnol), Bat, Weasel, and Mole.

Even at the present day, though there are no longer beasts of prey to purvey for their table, rats are abundantly numerous in the cavern, as we had reason to feel on more than one occasion. Instead of bringing out each day's supply, we laid in a stock of candles for a week, put them away carefully on a lofty shelf of the rock, to be used as wanted, —next day we found only the paper envelope of the parcel.

Not long after they visited us with a less pardonable grievance. A gentleman of Torquay, compassionating our neglect of dinner hours in our enthusiasm for research, very considerately provided a huge rook pie, that promised to stand at least a week's assault. After partaking of it once we deposited the rest in a species of cupboard at the end of the common entrance,—one of those offshoots of which mention has been made,—having first taken the precaution to wrap it up in sundry folds of napkins. Next day, at the close of more than usual exertion, through which we lost not sight of the treat in prospect,—we repaired to our larder,—there to our surprise remained but the dish, the cloths having been pierced through in all directions.—It was now clear that there still existed in the cavern marauders that loved rook pie as well



as their predecessors did widgeon,—the bones of which we picked out in the cave of Rodentia, the extremity of our oven-shaped cupboard.

### VESTIBULE OR SLOPING CHAMBER.

We have reserved the notice of this chamber to the last, it being by far the most considerable for its size and fertility in remains.

The arcade or cloaca on the one side, and the Wolf's passage on the other may be regarded as only its appendages,—but in our present examination we shall confine ourselves to its limits as defined by its walls. From the rapid inclination of the floor it is characteristically styled the Sloping Chamber. Its roof is pierced with spiral holes and clefts in all directions but closed at the surface,—through which flowed copiously the calcareous matter, consolidated into massive pendants, known as the chandeliers, the surplus of which fell on and formed the floor in a variety of concretions.

The upper level owes, partly, its elevation to large time-severed masses, detached from the roof by vicissitudes of temperature,\*—their former places may be traced on the roof. Similar blocks are scattered down the slope, occasionally embedded in the floor. In addition to these, small angular fragments, derived chiefly from the waste of the rock, swell the centre, accompanied by the remains of stray animals, or of such as retired hither to die, and articles of wood and flint dropped by visitors from the earliest periods,—the whole cemented together into a solid mass by calcareous infiltrations, producing the same effect as liquid lime poured into a stratum of loose materials.

Thus by degrees was formed the present floor of chemical precipitates, blended with mechanical deposits, to which, from the incrustation of its undulating surface, the guide gives the name of “the frozen billows.”

The earth upon which it moulded itself is, nearly through its whole extent, excavated away, for it was found more convenient to undermine than to break it,—it continues nevertheless to span over the chamber like a natural vault over a gulph.

The crust is thickest in the middle,—towards the sides it thins away. For opening the excavation the same means were employed as to break up a mass of ancient masonry.

\* More probably by shocks of earthquakes. In the recently discovered Cavern, at Brixham, sharp angular fragments of the limestone roof are found embedded in the stalagmitic floor, apparently derived from the roof, as the opposite sides of the fissure shew traces of friction. Groovings, probably produced by the same cause, may be observed in the neighbouring quarries.—E. V.

Flint blades were detected in it, at all depths, even so low as to come in contact with the fossil bones and their earthy matrix,—but never below them,—occasionally long bones protruded upwards through it, having received that vertical position at the settling of the mud, and were surrounded by incrustations ; but in no instance have fossil teeth or small bones been found in the crust.

In this receptacle were found, collected and interspersed together, in enormous quantities, the remains of all the animals, which had appeared separately or sparingly in the other parts. It was remarked that among the heaps there was scarcely ever seen an example of an entire bone—all, almost without exception, jaws and teeth as well as long bones, were broken and gnawed as represented in the plates.

#### GENERAL SECTION OF DEPOSITS BELOW THE STALAGMITE.

Immediately under the stalagmite, the deposits consist of a fine soft sand, composed of impalpable particles. In many places it had escaped altogether, leaving void spaces of several feet around—the remains at this stage were generally a few small light bones,—both they and their mineral accompaniments, such as fragments of limestone, &c., where the earth had escaped, were invariably invested with a thin coat of dry red mud ;—it reminded us of the slime that hardens on rocks in ponds during periods of drought.

Lower down, say from one to three feet, they become most abundant, usually large bones, such as the bases of horns and palate of Elk, and the solid portions of the bones of Pachydermata. At this point, the earth gets gravelly, interspersed with pebbles and larger fragments of rock and spar.

At from three to six feet, the remains diminish in quantity and increase in size,—from this depth were extracted the heaviest bones, such as the humeri of Elephant and Rhinoceros, and the skull of Hyena, loaded with mud. The earth at this depth grows more rubbly, as the workmen termed it, filled with blocks of limestone and spar—ranging from pieces of a foot long to several feet,—in the midst of them was picked up the ball of granite which has excited so much sensation.

Below six feet the difficulty of penetrating increases, in consequence of the accumulation of large masses of limestone. We however succeeded in sinking a shaft to the depth of 30 feet at the bottom of the slope, with the view of reaching the original floor,—we had to pierce

through loose ledge after ledge of limestone, accompanied with coarse rubble,—the detritus of the roof and sides,—meeting with rarely a vestige of bone. The few that were detected were much decomposed and bruised, or so soft, from over-saturation with moisture during their long immersion, that they crumbled at the touch. As there was so little apparent chance of arriving at the bottom, we gave up the pursuit in despair.

It seems that the floor, at the period of the addition of the mud which the animals walked upon, was at most no more than five or six feet below the stalagmite.

About five feet down in the excavation we encountered a block of spar of five feet in diameter, nearly globular,—that had been apparently detached from the roof. Having carried our section close to its side, we were proceeding with the shaft, when it rolled down into the pit ;—most fortunately we were advertised by some particles of earth that ran down the side, of its loosening. There was only time to throw ourselves back on the excavated heap, and, at the expense of a few bruises, to escape being crushed.

It may not be out of place to mention here, that during our operations in this excavation we were assisted among others by Viscount Valentia, and Mr Henry Maxwell, who succeeded in digging out some of the choicest treasures.

On other occasions I was attended by Lord James O'Brien, and other enlightened lovers of Natural History, Lord Newark, and Lord Henry Ker.

Among the scientific men who occasionally laboured with me I should not omit the late Venerable Dr. Beeke, The Bishop of Bath and Wells, Rev. Dr. Cooke, of Gloucester, Dr. MacTuck, of Glasgow, Mr. W. C. Trevelyan, Sir T. Acland, the Marquis of Northampton, Mr. Curtis, of Teignmouth, Mr. Croker, of Bovey, Rev. Mr. Lyte, Rev. Lawrence Welland, Mr. Featherstone, of America, and on several occasions by Dr. Buckland, to whom I was desirous to point out, on the spot, the position of the flint knives, and the alternation of the stalagmite with mould in certain chambers.

I avail myself of this occasion to record the labors of two enlightened clergymen in the same field :—The Rev. F. Belfield availed himself of the permission of the proprietor to open an excavation in the Vestibule,—the fruits of which, among other precious results, were teeth of Elephant, one of which belonged to a very old animal ; the bony substance between the enamel having been decomposed during its submersion in the mud, left the transverse ridges of enamel in relief,

exhibiting the wavy lines, peculiar to the Asiatic variety, to which it has the greatest affinity, in the most beautiful order,—the solidity of its fang shows that it was only just expelled from the mouth. The Rev. Lawrence Welland, a near relation of Sir L. Palk, likewise pursued investigations in this cavern, and with extraordinary success. The lip of the gigantic Bear was discovered in the cave of Inscriptions by Mr. Welland—I have compared it with the fossil jaws of Bear from the caverns of Germany, in the collections of Paris, &c., and have found none equal to it in volume—It must have belonged to an individual of prodigious size, not inferior to the largest Buffalo or ox. Mr. Welland was fortunate in making other discoveries sufficient to form a curious collection of the Fossil Remains from the cavern. Sir Lawrence Palk also possesses a similar series.

It may be desirable to enter into a more particular examination of the divers ingredients which fill the bottom of the cavern—and the mechanical arrangement of the materials,—we shall therefore commence in an ascending line from the bottom, reversing our former order.

The substratum of the deposit of mud and stalagmite, and that which seems to lie in immediate contact with the rocky bottom of the cavern is constituted of disintegrated portions of the bounding rock or shell of the cavern, viz, large detached masses and comminuted fragments of limestone;—the former appearing precisely in the state in which they fell from the roof, their ancient positions in which may still be traced in the parts not yet encrusted, and the latter, generally angular, partly derived from the breaking up of large blocks in their fall against others, and partly from the detritus of the crust during successive periods of frost and thaw, cold and heat, such changes of temperature as reduce the surface of all strata to the state of rubble and soil. \* \* \*

We sometimes remarked that the limestone was coated on one side with stalactites, incontestibly proving its having once made a part of the surface of the cavern—but not the least remarkable ingredient were the fragments of stalactites and stalagmites—the latter were broken into small slabs and dispersed through the mud not unlike pieces of ice through a river—the slabs did not exceed ten inches or a foot thick—but there were cakes of it of all degrees below that, in pieces generally a foot square at most, ordinarily much decomposed.

The blocks of spar were of all sizes from the thickness of the finger to the bulk of the enormous block buried in the centre of the vestibule. We preserved specimens of the smaller stalactites—one of which a foot and a half long struck us as particularly curious—from the character of its concentric zones;—it was one of those that capped the floor.

Neither large or small were rolled, simply broken off by the irruption of the mud in which they are buried. The large mass, most probably, formerly occupied the place of the present chandeliers.

The silicious or gravelly constituents vary in size, from the size of a pea, thickly interspersed with quartz and chert occurring in pieces of all dimensions to the size of my hand, flat and rounded, but always smooth at the edges like water-rolled pebbles.

The earthy matter contains an intermixture of animal matter with phosphate of lime and phosphate of iron especially in the Bear's den. \* \* \*

#### SUBSTRATUM, AND INTRODUCTION OF FOSSIL REMAINS.

In the condition of the substratum of rubble we behold the effects of atmospheric causes, similar to those in actual operation, in wearing down the surface of the rock and depositing the disintegrated debris on the bottom, during the lapse of a considerable period of time. In a word, the lower depths of the cavern were precisely as they should be expected to be, viz., strewed over with the waste of the rock, during the accumulation of which it appears to have been not at all, or but thinly, inhabited.

This appears to have been the ancient floor, on which were deposited animal remains, previous to the addition of their muddy envelope.

After the data furnished by the cavern itself it seems superfluous to prove that these remains were, the greatest part, brought hither by beasts of prey, which made it their dwelling, and which in their turn perishing by violence or natural death, left their own skeletons on the floor, confounded with the bones of their prey, and liable to the same fate. Upon no other hypothesis can we explain the accumulation of the mangled bones of such a multitude of herbivora and carnivora, and the presence of large quantities of excrementary deposits in their vicinity.

If it be asserted that they were transported from the plains by the muddy vehicle, this objection is instantly met by the condition of the bones, which, however much fractured and gnawed, exhibit their sharp angles, and where they retain their processes, it is almost invariably in all their integrity; even the most fragile jaws retain their milk teeth and their salient ridges. The balls of alum Grœcum also exist in the state in which they were deposited. In such a hypothesis too the remains would be found equally diffused through all the chambers, indiscriminately, instead of being congregated in particular places, and of being almost absent in others. \* \*

If we were not embarrassed by the abundance of proofs of the occupation of the cavern by beasts of prey, the extraordinary congregation of Rodentia would alone be an *a priori* argument of the existence of a depôt of offal in their neighbourhood; and on the other hand if we had never discovered the heaps of bones which crowded the passage into their den, we should have been authorized in presuming the existence of them.

I am aware that the great majority of these small quadrupeds belong to the species of the Campagnol or Field rat,—the existence of the carnivorous species is however indicated by the impression of their teeth on the large bones, few of which escaped their nibbling after they fell from the Hyena's mouth.

It seems established from an unbroken chain of evidence that the ancient floor of the cavern was covered with the remains of animals which made it their habitation, viz., the Hyena, Bear, and Campagnol. The two latter occupying its opposite extremities, and the former the rest, comprehending the centre and upper gallery. It further appears that the Bear's den was peopled exclusively by generations of that animal,—in which respect this branch of Kent's Hole resembles the caverns of Germany; also that the cave of Rodentia was inhabited chiefly by the Campagnol, but that the great body of the cavern was occupied by the Hyena, and that in addition to the remains of its own species, which perished in it by a natural death, were found those of its prey,\* accompanied by other evidences of the conversion of the cavern by them into a den, resembling the cavern of Kirkdale.

\* "The rich cavernous depository of the mammalian remains of that epoch, called Kent's Hole, has afforded, thanks to the persevering explorations of Mr. MacEnery, the desired evidence, viz., an almost entire skull with the teeth (fig. 45). This specimen exactly equals in size the skull of a fine male Arctic Wolf." A figure of this skull is also given in one of Mr. MacEnery's plates of the natural size; it is ten and a half inches in length.

"Fragments of shed antlers of the Red Deer, associated with others referrible to the *Megaceros* and the great *Strongyloceros*, have been found in Kent's Hole, at Torquay."

"Fragments of shed huge antlers and other remains of the *Megaceros* have been discovered in some of the ossiferous caverns in England. A characteristic specimen, now in the British Museum, was obtained by Mr. MacEnery from Kent's Hole; it consists of part of the upper jaw with both series of molar teeth; it precisely corresponds with the same parts of the skull of a *Megaceros* from Ireland."

"Unequivocal remains of this species of Bat (*Rhinolophus Ferrum-equinum*) from the Bone-cave, Kent's Hole, near Torquay, are contained in the British Museum: some of the specimens seem to be in the same absorbent condition as the bones of the Hyena, Rhinoceros, &c., from the same cave; others are evidently more recent. It is worthy of remark that the Greater Horse-shoe Bat is most commonly met with in Devonshire caves at the present day, and it is the only species known to frequent Kent's Hole."

"The remains of Shrew-mice which have been found in Kent's Hole and the raised beaches near Plymouth have offered no indications of species distinct from those now existing in Great Britain."—*Owen's Fossil Mammalia*.

Kent's Hole thus unites the characters of the two great divisions of caverns.

That while in this state the floor was surprised by a body of mud which swept up and confounded promiscuously the materials lying upon it.

That this body of mud so covering the bottom of the cavern was derived from without and impelled inwards in a fluid state.

That it was composed of the materials which it collected in its march, viz., sand, clay, and gravel.

That there is evidence of only one such irruption, and that there is no evidence of its having been preceded or followed by another.

Fragments of jaws and bones, perfectly corresponding, that have been divided not by the teeth of animals but by mechanical force, were picked up in the upper and lower gallery, at the distance of 70 feet from each other. I will not insist on the recovery of teeth in different chambers belonging to the same jaw, as they might have dropped out on the way as they were carried about in the Hyena's mouth,—but the fact is too curious not to be noted,—I allude to two tusks of a Bear of such peculiar form and stained in so remarkable a manner that they differ from the hundreds hitherto found and evidently belonged to the same individual.

From an inspection of the constituents of the deposit reposing on the substratum of rubble and enveloping the bones it is certain that it is merely the sediment of a fluid that held in suspension clay and gravel, which it swept up in passing over the surface of the adjacent country. Indeed so persuaded was the Rev. Mr. Belfield of its having once been the superficial soil of the plains that he had parcels of it laid out in his conservatory in the hopes of raising, from seeds possibly preserved in it, plants peculiar to that order of things, which would be found differing from those of the present vegetation, no less than the animals from their congeners of the present day. In addition to the debris of the circumjacent formations it contains rolled fragments of rocks transported from a distance, viz., from the great granite chain about a dozen miles from the cavern.

That it threw its waves into the cavern in a tumultuous state is manifest from the ruins of the ancient roof and floor buried in its sediment, in the shape of loose cones and slabs of spar, and in the accumulation against the opposite wall of heaps of bones.

At the foot of the slope splinters of bones and of stones were driven into the interstices of the rock, and the remains of rodentia, accom-

panied by fine gravel injected into the chambers of the skulls and long bones, places in which it was impossible for them to have penetrated without the agency of a fluid in violent commotion. But that it was as transient as it was violent appears from the unrolled condition of the bones, and still further from the state of the *album vetus*. The great majority of it was detained in the narrow strait, where it was deposited between upright walls in heaps—while scattered balls entangled in the mud, and perhaps carried down by eddies caused by cavities in the floor, were scattered through all depths. More of it from its buoyancy was floated upwards to the surface. The whole must have been reduced to powder, the teeth dislodged from their sockets, and the processes of the bones struck off in the supposition of a long continued agitation of the mass. It further appears that it subsided by degrees in proportion as the liquid in which the clay and gravel were suspended escaped through the bottom of the cavern. The large masses of rock and heavier bones naturally sunk undermost, just as they are found. Marks of its gradual subsidence before the stalagmite had acquired consistence, may be traced on the sides of the cavern like tide-marks on the cliffs.

Even after the commencement of the crust the masses underwent further absorption. (I do not mean the change of level, it suffered in the region of the Bear's den, which was caused at no very remote period by the yielding of its support.) It shrank partially away in several places of the sloping chamber, leaving cavities between it and the crust; the fossils and the stones so deserted retaining a coating of slime, precisely like rocks left uncovered in dry seasons. The surface itself was generally hardened into a paste composed of the finest sand and clay intermixed.

It will be inquired how came it to pass that the offscourings of the district are alone found within the cave. In the supposition of a fluid in movement that could carry such a body of mud into the cavern, it must necessarily have mixed with the adjacent sea, and consequently included in its sediment marine no less than terrestrial remains.

This objection would have force, if it could be shown that the waters of the ocean had risen to the level of the cavern before it was filled with the materials of the plains.

The contrary seems to have been the case. The land flood descended from the mountains to the level of the ocean, and if its direction may be inferred from its gravel, it indicates that it came from Dartmoor.

It can be conceived how the cavern and open fissures *may* have been



filled with a muddy sediment derived from the surrounding surface, by supposing its vehicle to descend from above in the shape of rain, and to have washed into the open cavities the moveable substances which it met in its march.

All this might have happened before the land flood had joined its waters to the ocean, and before the ocean had risen to the level of the cavern.

The absence of marine exuvise in the gravel of the plains no less than in that of caverns supports this view.

It is certain that the cavern was neither excavated by the erosion\* nor filled with the deposits either of the sea or running waters; of the latter, there are none passing through or near it, and as to the former, the cavern nowhere presents its sides to it—further, it is elevated above it at a height which could not be reached by it by the action of ordinary causes, and is about a quarter of a league distant from the nearest point.

It has been objected that the mouths are insufficient for the admission of such a quantity of mud—but it is not attempted to be shewn, by the persons who make the objection, that it was derived from the cavern—it is admitted that it came from without. It should be borne in mind that in their natural state before the addition of the mould as a guard against the entry of cattle, the apertures were wide and broad, and seem to have been amply large for the inlet of the mud, when it is recollected that it entered in a liquid state, and that according as it poured in it was swallowed up in the gulf within.

Had the floor at the time been on a level with the mouth it is clear that the fluid would have deposited its sediment against the opposing wall and speedily choked up the access to the rest of the cavern, but it was ascertained in the course of our excavations that before the accession of the mud the basin of the cavern was of vast capacity. The actual surface conveys no just notion of its original condition. It goes on expanding the lower we descend, growing wider and wider downwards conformably to the extended base of the hill which may be

\* The cavern appears to have originated in the upheaved of the hill in which it is situated by subterranean action, the fault, which does not appear to have opened at the surface, widening downwards; through this (prior to its upheaved, by causes such as elevated the raised beaches on this coast and submerged the forest in Torbay,) springs charged with carbonic acid rose, eroding, by chemical action, the surfaces of the rock and making tunnels in the smaller crevices. The same action is now probably going on below the surface of the sea near Churston, where a spring has been detected discharging large volumes of fresh water, doubtless also charged with carbonic acid gas. Numerous cases occur of the absorption and re-appearance even of rivers. In Surrey, for instance,

“The sullen Mole which hides its diving flood.”—E. V.

regarded as merely its outward crust. Even at present, raised as the level is, the floor descends rapidly at but a short distance from the mouths.

The fluid, therefore, instead of lodging its contents against the sides opposite the entrances, as it would do, were it to enter in the present condition of the cavern, was then lost if I might so express it, in the abysses below, as it rushed in wave after wave.

It seems most probable, however, that the ancient apertures were not confined to the actual inlets. It has been already remarked that the sewer-like passages which traverse the body of the deposit, as well as the sallyports, appear to have once opened in the sides (a strong current of air circulates through them), though we have not yet succeeded in discovering their vomitories, owing to the accumulation of rubble, or their being masked by the growth of coppiswood.

#### FORMATION AND CHRONOLOGY OF THE CAVERN.

To the question, how the cavern was originally formed, it may be answered, that without denying the action of elastic gases or igneous action as indicated by the presence of trap,—a conjecture may be hazarded that it assumed its present form from the junction of two opposite masses thrown together, whose lower extremities receded from each other as their summits met, the vacuum so produced becoming the cavern. The observations made by the learned engineer just cited seems to countenance this view. He further adds that the presence of stalactites and of stalagmites in caverns of any extent is a certain indication that they owe their origin to convulsions in the soil —“*La présence des stalactites et des stalagmites dans les cavernes un peu étendues est un indice certain que leur mode de formation se rapporte aux commotions du sol.*”

The direction of the stalactites in Kent's Hole favors this hypothesis, for they are most abundant along the presumed line of contact and union of the strata of the roof—and are nearly altogether wanting at the sides,—and it seems not improbable that it was by their accumulation that the vertical seam or rent was filled up. The longitudinal figure of the ridge still further favors this conjecture. Neither is there any indication of its having been, I will not say excavated, but even altered by the hand of man. It appears to be in the state into which it was thrown at the epoch of the disturbance of the district by trap, and whatever subsequent modification it underwent was at the influx of the mud into its womb.

We cannot dismiss the subject of the calcareous covering without making some observations on its condition and age—they are offered rather as conjecture than positive conclusions, respecting the latter especially.

It has been stated that owing to the exposure of the open chambers, the floor was liable, during the formation of its crust, to the accession of foreign substances, which in course of time were incrustated in it and made a part of it. That particular description of stalagmite cannot serve as a criterion of its age, but it has been seen that in retired situations it was pure from all extraneous matter, and that upon it a judgment might be founded. At the entrance of the corridor it has been shewn that the stalagmite was composed of a pure precipitate of calcareous matter without the admixture of adventitious substances, except half way down, where it was divided into equal halves by a thin horizontal seam of animal and vegetable matter,—from its first commencement this was the only substance that it received, nor did it meet with any other until it reached an equal thickness above it, that is, till by the cavern becoming much frequented, its progress was arrested by visitors. In fine, it appears that the floor was not trodden, from the period that it commenced forming, up to that when the above stratum of Boar's remains and charcoal were spread out on its surface, —and it is equally certain, from the absence of all foreign matter in the layer above it, that from the time of its deposition, up to a comparatively modern date, this part of the cavern remained unvisited.

The modern period, when the cavern came to be frequented, is marked by the cessation of the crust, and the deposition upon it of a coating of dark mould—but should it be closed and all access prohibited, the dropping would resume its process and create a layer of white stalagmite similar to those below it.\*

What then are we to infer from the presence of this seam that cuts the stalagmite in two? That when the crust had attained half its depth it was interrupted by the visits of the savage, whose spear was found in a grotto in the upper gallery along with the remaining portions of the boar's skull, accompanied by the head of a badger—one of whose under jaws was found in the seam—and that after he ceased his visits

\* The discharge of carbonic acid gas was probably as great formerly, as in the *Grotto del' Cane*, and numerous caverns in volcanic districts. This would account for its not having been then inhabited, and also explain, the more rapid deposition of stalagmite, reducing the period since the introduction of the flint instruments (which in the Brixham cavern also occur indisputably beneath the stalagmite) within the human period, a difficulty which Buckland and other geologists have met by presuming that they were subsequently introduced in the process of sepulture or other excavations.—E. V.

to the cavern the process of infiltration resumed its work in continuing the stalagmite to its present height.

It is a curious inquiry to ascertain at what historic period the cavern was visited by the boar-hunter armed with his iron spear. Could we arrive at an approximation to that period, by doubling it we might have the age of the stalagmite. An intermediate period between the epoch of the deposition of the mud and the present time is strongly indicated—which squares with that assigned by history for the occupation of this country by its savage aborigines which dwelt in native caverns and pits which they dug underground, before they formed into societies and built themselves abodes on the surface, brought fields into cultivation and assumed a civilized form. If we may compute by this scale, taking the charcoal seam as a species of chronometer to measure the time elapsed before and since its deposition, we shall have pretty nearly the time which should elapse since the Deluge—viz., four or five thousand years—so that this cavern may be said to furnish evidence not only of the fact but also of the epoch of that event.

#### HUMAN REMAINS.

The learned have been long occupied with the question, whether the remains of man exist in a fossil state. The question has been resolved in the affirmative by ancient observers, who mistook the remains of other animals for human : and amongst the moderns those who admit the existence of fossil human bones are in error respecting the application of the term *fossil* to them.

M. Cuvier has shown that the group of bones brought by Spallanzani, from the Island of Cerigo, belonged to whales, and that the *Homo diluvii testis* of Schreuchzer was only a chameleon of large size and of an unknown species. He has equally shown that the bones and works of art discovered at Cronstadt were collected without any regard to their geological position,—and consequently no certain conclusion could be thence drawn. Cuvier seems to think that the real bones of man, gathered from different parts of the globe were the remains of bodies that had fallen into clefts and fissures or had been interred in ancient galleries and covered with incrustations,—and that it was the same with objects of human art found with them. Thus, according to him, the remains of our kind do not appear in the same beds with the fossil ; a point at which we arrive, equally, if we observe that life has gone on in this globe proceeding from the simplest forms to the more complex, and that, the fossils stopping at the quadrupeds, there was reason to

presume that the Human species had not at least *all* perished with the animals which we discover in a fossil state on the Continents which have risen out of the bosom of the waters.

We all know the history of the Guadaloupe skeleton. The bones preserve their gelatine and phosphate of lime. Their stony matrix consists of a calcareous rock formed of milleporite intermixed with shells and madrepores, which shews that the remains are not enveloped by an ancient and regularly stratified rock, but by a local and modern incrustation. What we know of their position gives to this opinion the air of probability, for though these skeletons are in considerable number, they are only partially encased in the madreporite which forms their envelope, at a level, too, so inconsiderable above the beach as to be covered at high tides.

This discovery does not prove, it is clear, the existence of human bones in regular strata. We do not regard as such, stalactites or Tufas which are constantly forming by the deposits of certain springs, or infiltrations, and which are found to envelope occasionally human bones, as is the case with those found in the grotto of Durfort,—of which by and by.

Since the discovery of Guadaloupe, M. Schlothiem has announced the discovery of human remains in ancient Gypsum, in crevices and cavities which traverse it in all directions, with the bones of deer, sheep, squirrel, land mice, bat, mole, and bird. M. Schlothiem admits that the facts require further investigation, and doubts whether the bones may not have proceeded from additions at different epochs.

M. d'Hombres does not entertain the same doubt respecting the human bones discovered in a cavern in the neighbourhood of Durfort, or grotto of the dead, in the department of Gard,—he at once designates them fossils.

M. Mercel de Semes visited this grotto in 1818, and collected a large quantity of human bones, but was far from considering them fossil, from their position, and several other distinguished savans were of the same opinion. The slight alteration in these bones, the manner in which they were found heaped together without any order, the modern stalactites which incrust them, determined them to the conclusion that they were brought to this subterranean cemetery, as were the bones of churches into the catacombs or quarries of Paris.

The discovery of a human skeleton in breccia, from the Island of Samos, with modern shells, may be classed under the same head.

There is no reason why human bones should not be discovered with those of animals, if man occupied the same countries with them.

There is nothing in their composition to render them more perishable. If human bones had been buried by the mud which envelopes those of animals there was more probability of finding them preserved from the favourable circumstances than those which at a great distance from that epoch were consigned to the loose earth at the entrance.

The very circumstance of the diffusion of large animals and beasts of prey over the surface may have made man collect into communities for his self-defence and protection ; and at best his numbers could have borne but a small proportion to the races of animals which thickly peopled the forests and plains.

As he was not likely to associate with them it is in vain to look for his remains among theirs,—but it is not at all impossible that his remains may be yet found collected together where whole communities perished by the same catastrophe that overwhelmed the Elephant, Rhinoceros, Hyena, Tiger, and Bear.—If ever a temptation offered for passing the Human skeleton for a *Homo diluvii testis*, it is here, where accompanied by his weapons, he is found mixed up in the Diluvium with the bones of the Elephant, but a regard to truth compels me to declare that all the attendant circumstances tend to the conclusion that his bones were deposited here by human hands, at a period long posterior to the introduction of the muddy sediment into the cavern.

Esper found in a remote chamber of Gaileneuth portions of a Human skeleton, as also did Rosenmuller,—those found by the latter were clearly deposited there by the hands of man at no remote period, as is evident from the regular order of the interment.

Those of Guadaloupe were also not very ancient, from the modern quality of their milleporite envelope. The same may be said of a Human skeleton now in the Jardin des plantes, in a species of breccia, composed of modern mould and shells. It cannot even claim the antiquity of that of a Greek lady preserved in the Gallery of anatomy in the Jardin des plantes, the traces of whose clasps and bracelets and earrings remain.

M. Shuerling in his turn claims remote antiquity for his Human remains found in the cavern of Engis, Liege, and carries it as far back as the epoch of the fossil animals.

“Cest à un mètre et demi de profondeur que nous rencontrâmes ce crane, caché sous une brèche osseuse composée de restes de petits animaux et contenant une dent de Rhinocéros et quelques unes de cheval et de ruminans—la terre qui contenait ce crâne humain n'indiquait aucun dérangement ; des dents de Rhinocéros de cheval, d'hyène

et d'ours l'entouraient de toute part—Le peu d'elevation du frontal, son étroitesse et la forme des orbites se rapproche plus de crâne de l'Ethiopien que de l'Européen,"—from which he concludes that it belonged to a man whose intellectual powers were little developed, and consequently proceeded from an individual not in an advanced state of civilization.

Another skull belonging to a young person was found at the bottom of the same cavern alongside the tooth of an Elephant. It was entire when first discovered, but fell to pieces in the attempt to remove it.

The same phenomena he remarked at Engihoul, covered but partially with stalagmite,—they belonged to men above five feet and a half in height, French measure.

Mr. Lyte found several heads in the Ash hole near Brixham, at great depths, supposed to have belonged to the Roman garrison.

There is no reason why man, who is allowed to have lived before the last catastrophe that destroyed animal life on the globe, should not find his analogue among the existing race as well as the animals which lived in his time find theirs in ours.

What Cuvier said of Kirkdale applies to this cavern—"Si les Hyènes de Kirkdale n'ont point accumulé d'ossements humains avec ceux de tant d'herbivores dont leur caverne est remplie, c'est qu'elles ne trouvaient point d'hommes dans leur voisinage, ni en vie, ni morts, et l'on peut considerer ce fait comme une preuve de plus que notre espèce n'habitait pas avec les animaux que je reproduis aujourd'hui à la lumière."

According to General Ernouf the consolidated sand which contains the human bones at Guadaloupe holds also shells of species now inhabiting the adjacent sea and land, together with fragments of pottery, arrows, and hatchets of stone.

I cannot sum up better than with the remarks of Dr. Buckland, in reference to the discovery of human bones in diluvium, in the Bridgewater Treatise. "The occasional discovery of human bones and works of art in any stratum within a few feet of the surface affords no certain evidence of such remains being coeval with the matrix in which they are deposited. The ancient practice of interring the dead, and frequent custom of placing various instruments and utensils in the ground with them, offer a ready explanation of the presence of the bones of men in situations accessible for the purpose of burial.

"Again—Frequent discoveries have been made of human bones and rude works of art in natural caverns, sometimes enclosed in stalactites, at other times in beds of earthy materials, which are interspersed with

bones of extinct species of quadrupeds. These cases may likewise be explained by the common practice of mankind in all ages to bury their dead, in such convenient depositories. The accidental circumstance that many caverns contained the bones of extinct species of other animals, dispersed through the same soil, in which human bodies may at any subsequent period have been buried, affords no proof of the time when the remains of men were introduced.

"Many of these caverns have been inhabited by savage tribes who, for convenience of occupation, have repeatedly disturbed portions of soil in which their predecessors may have been buried. Such disturbances will explain the occasional admixture of fragments of Human skeletons and the bones of modern quadrupeds with those of extinct species, introduced at more early periods and by natural causes.

"Several accounts have been published within the last few years, of human remains discovered in the caverns of France and the province of Liege, which are described as being of the same antiquity as the bones of Hyænas and other extinct quadrupeds, that accompany them. Most of these may probably admit of explanation by reference to the causes just enumerated. In case of caverns which form the channels of subterranean rivers, or those which are subject to occasional inundations, another cause of the admixture of human bones with the remains of animals of more ancient date, may be found in the movements occasioned by running waters.

"Mr. Lavoillard has shown me Human skeletons from the Island of Samos, associated with pebbles and shells of several kinds—all mixed up together and consolidated into a solid mass. It is easy to see that these bones do not differ from the condition of grave bones, and that the matrix is only rubble hardened and agglutinated together.

"I am persuaded that if due attention were paid to the place in which these remains occur—and the manner in which they are intermingled with the soil and bones reputed fossil, it will be in every case found, as from a display of similar phenomena in this cavern, that they are not coeval either with one or the other, but that they had been added subsequently to the deposition of the former, and commingled with them into a common heap by causes such as operated here, I mean the visits of man, or according to their position by the disturbing action of running waters."

Had I not devoted so long a period to personal examination of all the circumstances attending this delicate question, I should have fallen in common with others into the error of supposing human remains to be contemporaneous because conjoined with the deposit of mud and bones.



—Into this opinion I fell at first from the discovery of flint blades in contact with both in several parts of the cavern and the alternation of stalagmite, and I communicated my impression to Dr. Buckland with all the earnestness of sincere conviction. To this doubt chiefly is owing the original delay occasioned in the publication of my labors. It is only from extended observation in the entire field of the cavern, that I have come to the conclusion, that human bones are long posterior to the sediment containing pebbles and bones, and that they date no more than half way down from that period.

[The following passages occur in the original notes in reference to the discovery of human remains in Kent's Cavern :—]

14th Aug. 1829.—Visited the Cavern in company with Mr. Alliffe.—We commenced by searching the surface mould. In the present case it reposed, immediately, without the intervention of a crust, upon the red deposit, from which it was clearly distinguishable by the blackness of its substance, which stained our hands and clothes as if we had been working in a coal mine. On the top it was composed of recent substances, such as the remains of fires, feasts, and other ordinary matters. About a foot beneath, a new scene disclosed itself; fragments of pottery, both plain and ornamented, lay strewed about in abundance, mixed up in a dark crumbling mould containing a quantity of marine and terrestrial shells, such as *Patella*, *Limpet*, *Ostrea*, *Turbo* *Pinna*, *Helix*, *Solen*, &c. Among the broken pottery there were intermixed a multitude of remains of divers species of Stag, Fox, Rabbit, and Rodentia; many of the bones were as black as the charcoal layer which contained them, and nearly decayed, so that they were difficult to determine; others tolerably perfect. Among the bones we found some curiously fashioned by art. The articulation of the larger extremity was left untouched, while the other was tapered to a point and polished. We found three specimens of this sort; one the brow antler of a Stag.

A large rock now lay between us and the next stratum; on lifting it over a still more startling discovery was displayed :—pottery, charcoal, human teeth and bones, flint relics, copper ornaments and mountings of tin,—two lumps of virgin copper ore were pressed together into a cake. They reposed upon a large flat stone, against which they had been violently crushed by the superposition of the rock which we had just removed. We collected on this spot the remains of two sepulchral vessels; one was a plain urn, slightly indented, of coarse sun-baked pottery, at the edge about half an inch thick. It most probably had contained the ashes which were spilt about, and two black spear heads mixed up with it. The other fragments were thinner and highly

ornamented, answering in every respect to those small figured vases found in the Barrows, and designated, by Sir Richard Hoare, drinking cups. The pieces of both vessels were scattered at a short distance from each other on the flag, and were evidently connected with the human bones, flint relics, and other substances just described as grouped together; the whole forming a distinct interment. From the position of the bones it would appear that the body had been laid nearly in the centre of the entrance lobby, with its head towards the east or mouth; the teeth, most of which were collected, are, with one exception, sound and undiscoloured; that they belonged to a robust adult, they and the fragments of the skull and vertebræ abundantly testify. The front or incisor teeth are what are called double teeth.\* The portions of the extremities, as the phalanges of the hands and feet, were also found, and other parts of the frame; but owing to this passage being readily accessible to those who might be led by curiosity or in search of treasure, the floor had been partially disturbed. The ground under the skeleton was next explored. Directly under the burial stone the earth changed its colour to a dirty red, something resembling the diluvium in quality also. It was however more crumbling. Here again another phenomenon arose upon us. Arrows and spear-heads, stone axes—all of white flint, beautifully shaped, occurred amongst fossil teeth and bones of herbivorous and carnivorous animals; numerous chippings and some blocks of the silicious material, were likewise found; but here no vestige of pottery or ornaments were to be seen, simply flint weapons scattered through the surface of the mud. Having cleared away the crumbling stuff, we arrived at a more compact deposit, which was more stiff and red. Hitherto the soft earth fell away at the least touch of the hammer, but now the pick-axe was called for in order to remove the large and angular stones which were set in a stiff clayey bed; here the unadulterated diluvium spread before us. We looked in vain at this depth for flints, or pottery, or human bones; only the usual contents of the diluvial bed, mere animal remains, came up with the spade.

An inconceivable quantity of a superior black pottery, highly glazed and richly embellished, was found near the surface; traces of the lathe were visible in the circular grain; the beautiful fern-like impressions on its lips and sides were evidently made by an instrument like that used by bookbinders for indenting vellum;—a stone having one surface stained a bright red, small oblong beads of opaque crystal glass, shells used as necklaces, a piece of silver inlaid in wood, which crumbled at

\* See Note, page 17.

the touch, a segment of a ring or amulet,—from these and other accompanying relics there can exist no doubt of the skeleton being an ancient Briton. The sun-baked urn, the fragments of a breastplate, the lumps of virgin ore, heaps of shells, and pins and bodkins of bone, all attest an analogy to the instruments in barrows decidedly British,—but perhaps of Romanised Britons, for the relics of art show a more advanced state of civilization than the rude and solitary flints found at a greater depth, along with which, neither in this place nor in any other similar locality in the cave, have there ever been found any other indications of human resort.

\* \* \* \* \*

Near the upper mouth a pit was found hollowed out in the stalagmite, sealed over at the top with a thin pellicle of spar, beneath which there were discovered, a singular assemblage of broken pottery, reddish-colored and calcined bones, a collection of shells, and a curious ornament of bone, in shape not unlike a scissor's case, pointed at one end, and notched, like a comb, at the other. The whole appeared to have been repeatedly disturbed, and fragments of former crusts occurred, intermixed with the relics; the pottery was broken, and the matters which had most probably been enclosed in it were scattered loosely about.

Near the verge of the pit a large quantity of the same description of pottery was buried in a brown pulverulent earth, overlaid by a skin of stalagmite, supporting a layer of modern mould; among the pottery were dispersed a number of oval-shaped pebbles of sandstone, limestone, and chert, seemingly formed and polished by art, copper nails, various species of lacustrine and marine shells, the palate of a fish, the surface of which was studded with pearl-like excrescences, also a pin of bone retaining at one extremity the articulating joint, but shaped to a tapering point at the other; this bed was about two and a half feet deep, it rested upon a second plate of stalagmite, about six inches thick, which completely divided the substratum from the bed upon it. At the bottom of the Wiltshire tumuli cists, or basins, for the reception of the ashes, ornaments, and arms are found,—this excavation was evidently cut for a similar purpose.

The contents of this bed suddenly changed from the preceding. A Hyena's tooth first met my eye, then one of horse, another of large deer, and the jaw of a fox. In the midst of these I beheld a profusion of small chippings of flint, with a few well-formed arrow heads and blades.

I instantly covered up such of the flints and bones as I had not

disturbed, in their situation, and desisted for the day, with the determination of announcing the anomalous discovery to Dr. Buckland, whom I promised to apprise of the next discovery of flints. Having occasion to inspect one of the fossil bones, the brownish colour and character of the loam struck me as unusual. I suspended my intention to write until after further investigation, and repaired early next morning to the scene of my previous labours.

In enlarging the excavation I fell in with more flints, two or three vertebræ, which I was at a loss to determine; at the next blow I knocked out the fragment of a Human cranium and teeth, which soon threw light on the vertebræ. As I advanced, a piece of another skull, much slighter than the former, and two human teeth, belonging to a young individual, caught my attention. When I had cleared away a level area of a few feet around me, I applied to sinking still deeper into the loam, when, behold, the ground became suddenly solid and compact, the flints, of which I collected about sixty in the earth above, suddenly disappeared, human remains likewise vanished, and fossil bones of quadrupeds prevailed exclusively in the undisturbed region of the mud. By comparing the earth on the fossil and human bones, the upper surface with that investing the fossils below, there was a manifest difference, specks of charcoal and a brownish vegetable mould appeared blended into an impalpable mass with the firm red loam, which, with its fossils, was dug up and thrown about among adventitious matter, at the time when the entrance was deepened and enlarged by the people who seated themselves near the mouth to avail themselves of the light to fabricate their flint knives. There is a visible difference in weight between the animal and human bones;—the former are heavy and compact, and firmly attach to the tongue, the latter are much lighter, and in appearance approach nearest to grave bones, than which, however, they are firmer, heavier, and better preserved. \* \* \*

#### BRITISH ANTIQUITIES.

A review of the dawn of the history of one's country—the desire to detach from the mass of fable which time has necessarily accumulated, those precious relics which accident or research discover to our view, and which often lead to the elucidating of the most important events in its history, has ever been regarded by thinking men as not below the consideration of rational minds, and should in their view comprehend Human nature in all its stages—whether civilized or rude.

Abstractedly from the inherent interest which every new chance memorial of one's own nation awakens—there is a still higher motive superadded which should fix our attention to these relics of past ages, when they serve as a connecting link between the epochs in the history of the human race, and discover a connection with those revolutions of the earth in which it bore a part.

Considered in this light, the relics I am about to display to the reader claim his attention. They are few, and considering the lapse of time and those events which have destroyed the more durable monuments of still later nations from the fate of which they have been singularly preserved, it is quite wonderful that they are so many ;—and insignificant as they may appear to be, which is also natural, recollecting the rude people to whom they belonged, those very circumstances seem to demand for them a larger share of consideration. When the materials are abundant,—their age not remote, and their history preserved, the mind and the eye find little difficulty in explaining their phenomena. Thus the relics of Herculaneum, Pompeii, and Stabiæ, illustrate the narrative of Pliny, and Pliny them. \* \*

Nor is it a vain or a sterile pursuit to endeavour to lift the veil from the primitive history of the animal kingdom in general, to lay open the condition of the country, as far as it may be permitted us at this late hour, as it existed before the revolution which swept away its population ;—to expatiate through its plains, to climb its mountains, to penetrate its caverns,—those buried cities of the antediluvian age, in whose archives the documents of its vicissitudes are best preserved,—and thence to proceed to the unfolding of the germs of a re-peopled world—whose descendants enjoy the maturity of that society of which they laid the foundation. \* \* \*

## FLINTS.

Among the multiplicity of substances associated with the animal remains, the occurrence of flints and chert, in different forms, claims separate and particular consideration. They are of three sorts.

The first are about an inch long, fined off at the sides, and pointed at one end. These appear to have been used as arrow, spear, and lance heads—cuneiform ; about a dozen of these have been found, and no doubt many more escaped observation from their minuteness. There are a few specimens formed with great art, sharp pointed and barbed.

The second variety consists of oblong double-edged splinters, plain on one surface, but raised on the obverse ; a central ridge traverses

the length,—the remains of the plane from which the trenchant edges of the side have been sliced off, truncated at their extremities. They vary from two to three and a half inches in length, and are generally three-quarters of an inch in diameter. There is also of this description a still smaller size, not much larger than the blade of a pocket-knife, but in all respects similar to the large ones. This species seems to have been employed as knives or chisels for dividing and shaping wood, and exhibit the marks of wear on their edges.

The third kind are oval-shaped disks, chipped round to an edge from two to three and a quarter inches across; some of them diminish to a point, like wedges. This part in these specimens was observed to be blunted apparently from knocking like a hammer against hard bodies,—while the sides, which in such an operation would not be used, still remained sharp. They are obtuse and massive on one side, but sliced to an edge at the opposite—capable of acting as wedges in splitting wood, or striking off the smaller splinters of flint from the blocks. I have found several splinters of limestone and bone, of precisely the same shape as the three above, but being of less durable material they are not so well preserved.

The generality of the three species are invested with a chalky coat, resulting from decomposition of the outward laminæ; in a few specimens the silicious matter has totally disappeared even from the core, only the residuum of phosphate of lime remains,—at their transverse fracture they are porous and adherent to the tongue, like the fossil bones, and support their weight.

A good many have however escaped with only partial modification of their substance, one extremity has retained its properties, while the other has suffered change,—one of the knives the late Mr. Philips, the eminent mineralogist, considered to be formed of silicious schist. It does not possess the conchoidal fracture of flint,—and moreover exhibits minute specks assumed to be Chlorite and is transparent at the edges, but Dr. Buckland pronounces it to be black jasper.

Sir R. Hoare mentions (p. 79, Vol. I., of *Antiq. Wilts*), black stone celts or battle axe, very likely of the same material.

In reviewing this collection of flints you are first struck with the uniformity of size, as well as structure, observable in the specimens constituting the three species; every chip being referrible to some one of the classes specified. In this respect they differ from the splinters accompanying the great deposits of flint nodules of Haldon and Black-down, no two of which are alike; but the regularity of their fracture precludes the possibility of these cavern splinters having been produced

by accidental collision with other substances,—and even supposing this to be the case, the remaining nodules would be found as well as the pieces which are designated flint knives,—but it is curious that flint occurs under no other form than in those just enumerated.

Their mechanical origin is placed beyond all doubt by the discovery of analogous splinters in Mexico, accompanied by the cylindrical blocks from which they were derived. The longitudinal planes of one surface and the sliced edges of the other precisely correspond with the raised surfaces of the parent block,—from one of these Mr. Chantry has struck off splinters in no wise distinguishable from the articles in question. The only difference between the Mexican and Cavern blades consists in the material,—the Mexican being fabricated of obsidian, the cavern reliques, of flint, chert, or jasper. By the kindness of Mr. Sloper, who presented me with one, I have been enabled to compare the latter with his collection; both knives were uniform, and bore evidence of having been produced by a similar process, as ascertained by Mr. Chantrey's experiment.

Mr. Hilbert is of opinion that in the Orkney Steinbarts or stone-axes traces of the mounting are discoverable; he conceives that they were inserted in wooden or bone hafts, and fastened crosswise with overlapping thongs formed of the dried sinews or entrails of some animal. An analogous specimen to that figured in Brewster's *Edinburgh Journal*, and restored to what was probably its original mounting has been found in Kent's Hole; and it is curious, as confirming his conjecture of the mode of using these axes, that the cavern flint is blunted at its opposite ends like a hammer, while the edges of the sides are not at all worn.

Flint knives, Steinbarts or stone-axes, have been found in Shetland and the Orkneys, improperly called Celts, a term of great latitude erroneously applied to warlike instruments found among different peoples, supposed to be the aborigines. Nor is it an uncommon thing to find arrow heads of flint in the ancient cairns of stone in our own country. (*Gough. Sep. Mon. Vol. I., p. 18.*)

Flint heads for both spears and arrows are frequently found in England, Scotland, and Ireland. (*Crosse's Mil. Antiq. Vol. II., p. 274-5.*)

Lieut.-Col. Vallancey in his *Collectanea* gives a delineation of a spear head of flint found in Ireland.

Barbed arrow-heads, made of pale coloured flint, are frequently picked up on the Moors near Durham;—they are called Elfbolts.

In Druidical barrows in Somersetshire and Wilts, opened by Sir R. Colt Hoare and Mr. Miles, were found flint arrow heads and knives,

along with sepulchral urns and Kimmeridge coal money. (Sir R. C. Hoare, *Antiq. of Wilts. Miles's Memoir*.) The figures of the flint celts delineated in plates 5, 6, are equally just representations of those from the cavern—both species are of white flint.

They would seem to have been used by the Saxons, as appears by an extract from a Teutonic Romance of the eight century,—“Then they first let ashen spears fly with rapid force that they stuck in the shields; then they thrust together resounding stone axes.”

They occur near the Humber, and in Warwickshire, in different forms. The blade of one found in England, and described by Whittaker in his history of Manchester, contains an orifice calculated to admit within it a wooden haft; there is no orifice displayed in the blades from the cavern, but there are transverse indentations in one or two, as if for the purpose of more effectually securing them to the shaft.

I have identified the flints with similar relics preserved in different Museums both in England and France—those especially which are in the British Museum, and in the Museums of the Jardin des Plantes, and of Boulogne Sur Mer.

From the occurrence of these uncouth instruments in widely distant regions it would appear that the barbarous aborigines scattered over the globe left behind them these memorials of their primitive inventions in their early settlements. It was but natural for a people unacquainted with the use of metal to seize the first hard substance which offered to their hands, and apply it to hewing wood, and shaping and mounting their arrows and such like instruments of savage life.

In progress of time they would learn to select the hardest substance, such as flint, chert, or obsidian, and experience would teach them to adapt them to the present form of arrow and spear heads, knives and axes. But though their necessities might have taught them to shape their instruments to their wants, the extraordinary uniformity visible in those collected in different parts of the earth could only result from a common method learnt by these different nations previous to their emigration into distant climes,—and would seem to indicate the common origin of the first colonists of the earth.

Grose is of opinion that these flints were the first rudiments of our instruments of war. “The spear-head or lance is among the oldest weapons recorded in history, originating in a pole or stake sharpened at one or both ends,—afterwards armed with a head of flint, and in process of time, on the discovery and use of metals, with copper, brass, and iron.” (*Mil. Antiq.*) The ancient inhabitants of Britain formed of basalt the heads of their battle-axes, commonly called Celts,—they re-



semble in shape the Tomahawks found in the South Sea Islands. (Conybeare's Geology.)

Herodotus relates that the arrows of the Ethiopians were pointed with a sharp stone, and the ancient Germans generally prefixed pointed stones to their weapons. (Grose Mil. Antiq.)

Even so low as the conquest of South America, hatchets and wedges of stone heated by fire were employed in felling wood—and by casting in red hot stones into trunks of trees they excavated and modelled their canoes and cauldrons of wood for cooking.

Flint and other Pebbles—oval and circular, from a pigeon's egg upwards, of flint, sandstone, &c., were most probably used as missiles in slings. They are abundant in the barrows, and in the most ancient Celtic sepulchres. The circular flat stone found in Berryhead cave was used probably for the same purpose,—the perforated one for a bead, as also that from the clay of the upper branch of Kent's Hole.

Having described the form of these singular flints and pointed out their analogy with similar reliques discovered in the sepulchral monuments and habitations of the first settlements of the aborigines of the different countries over which we traced them, it is our duty next to state the position they occupied in the caves under consideration.

Excepting the solitary instance of their occurrence in the disturbed shingly covering of the loam, in the higher division, to which we have already adverted, their uniform situation is intermediate between the bottom of the stalagmite and the upper surface of the loam forming a connecting link between both—one extremity has been generally found inserted in the loam, the other protruding upwards into the stalagmite above. I possess two examples of this description. From its immediate contact with the crust, the under bed is indurated to a breccia including bony and rocky fragments,—in the centre of which the lower end of the flints are frequently imbedded.

They have likewise been found, though rarely, at a still lower depth, dispersed irregularly through the loam promiscuously with the other relics and materials—and from the fact of detached pieces being found at distances apart from their corresponding portions it would at first view seem that they were subjected to the same movement as the bones. Portions of flint knives, of which the remaining parts could not be recovered, have also been found under the same circumstances. Of this description I possess half a dozen specimens, some of which are still encased in the indurated loam mixed with spar, but the greatest depth that I have been able to trace them down has been no more

than a few inches below the surface of the mud,\*—they have never appeared so low as the substratum of rubble.

On the other hand, it is singular that they never have been traced upwards towards the surface, like the charcoal and Deer's bones of later accession at various depths in the stalagmite;—still less have they disclosed themselves in the loose modern mould on the floor of stalagmite, but almost invariably repose in the intermediate space between it and the region of diluvium partly attached to both—yet holding no absolute connection with either, farther than the casual circumstance of contiguity and contact.

Hence the natural and inevitable inference is that antecedently to the superimposition of the plate of stalagmite they lay partly exposed on the surface of the loamy sediment, and that owing to its soft, if not fluid state, some of them sunk down through it to their present situation, or from some artificial cause, such as the excavation of pits or ovens in the loam, scooped out for the purpose of cooking game, they were dropt into them and the loam turned over by those who sat round preparing their weapons for the chase or dividing the carcasses of their prey. The occurrence of bones in the same position bearing evidence of being smoked and calcined strongly supports this conjecture; and still higher up, interposed in a seam about the middle, a few inches in the incumbent crust of stalagmite, charred bones of Hog and Deer enveloped in carbon have been dug out.

It will follow as a corollary from this view that the cave was almost instantly visited posteriorly to the introduction and subsidence of the loam, and before the formation of the new superstratum of stalagmite,—for unless interrupted by the intrusion of man, as was observed to be the case in the Bear's den, the progress of encrustation would have immediately commenced and glazed over the surface of the loam before the insertion of the instruments of flint.

The epoch of the introduction of the knives must therefore be dated

\* In the Brixham cavern nine flints have been found similar to those described as arrow-heads, and one of much larger dimensions, being nearly six inches in length, and of a wedge shape like a rudely formed celt. Some of these were at a depth of about two feet from the surface of the loam beneath the stalagmite, and apparently introduced under precisely the same condition, as the fossil bones and teeth. In the exploration of Kent's Cavern by the Torquay Natural History Society, flints were found beneath the floor, in a portion of the cavern where the stalagmite could never have been broken up without quarrymen's tools. A paper which I wrote on this subject was read before the Geological Society, but was considered so heterodox that its insertion in the Transactions was delayed until the late lamented Dr. Buckland could again visit the cavern which he was never able to accomplish.  
—E. V.

antecedently to the advance of the stalagmite, from the era of the quiescent settlement of the mud.

I had taken this view of their position and history some years ago. I have employed the interval in carefully investigating their locality. I first discovered them mixed with Human bones in loose carbonaceous mould within half a foot of the surface, near the mouth,—the crust had been broken up and its remains were visible in flakes scattered through the mould,—when we descended about three feet the loose black mould gave place to a firm bed of a dirty red color, the surface of which displayed the singular phenomenon of flint instruments intermingled with fossil bones!—about a foot lower down they disappeared, but the fossil bones continued constant to the red marl. Thus far their consistence in the present state of the cavern was determined. Still the difficulty remained unsolved, viz., whether the flints did actually occur under the unbroken floor of stalagmite—and whether they originally co-existed before their position was invaded. In this spot the crust was confessedly disturbed and removed,—and in the other localities, though there was no doubt of their existence under the crust and touching the mud, there was still a doubt whether the crust had not been dug through for ovens and pits, the stalagmite in those places assuming rather the character of a conglomerate, than a regularly stratified bed,—but now there is no longer a question of their actual presence under the stratified unbroken floor of stalagmite. All along the lobby-like passage it has been already remarked that they abounded, but under ambiguous circumstances,—it now became imperative to continue on excavating towards the end till we should fall in with the crust, at its undisturbed point, and we succeeded,—its sharp edge appears at the base of a flat rock, which accurately compared with that of the excavation made farther in near the end of the lobby, presented precisely identical characters. Having cleared away the loose mould and all suspicious appearances, I dug under the regular crust, and flints presented themselves to my hand,—this electrified me;—I called the attention of my fellow laborer (Aliffe), and in his presence extracted from the red marl arrow and lance-heads. I instantly proceeded to the excavation, inside, which was only a few feet distant, in the same continuous line, and formed part of the same plate,—the crust is about two feet thick, steady, the clay rather light red;—about three inches below the crust the tooth of an Ox met my eye, which I extracted before Aliffe; I called the people to witness the fact, and not knowing the chance of finding flints, I then proceeded to dig under it, and extracted a flint arrow-head,—this con-

firmation I confess startled me. I dug again, and behold a second, of the same size and color (black.)

I a third time struck my hammer into the earth, and a third arrow-head, but white, answered to the blow. This was evidence above all question. I then desisted, not wishing to exhaust the bed,—but in case of cavil, leaving others an opportunity of verifying my statements by actual observation. I said the tooth of the Ox occurred at the depth of about three inches,—the envelope light red,—it continued so till we joined the flint bed. Here a darkish layer and crumbly ran round the excavation,—bits of charcoal, still were visible,—the bed emitted a disagreeable smell; pieces of branches were still distinguishable by their knots. This is the region of the flints. Here they were deposited before the addition of the plate above,—most probably, at the same epoch, with those nearer the mouth above which the crust formerly extended but was stated to be removed,—and also with those in the great chambers, where it has also been stated they occur under stalagmite, but less homogeneous and regular. Hence it results that the flints at the extremity of the lobby were deposited in their deep position, before the creation of the stalagmite, by the primitive nomads,—and that those nearer the mouth were similarly circumstanced, i. e. overlaid by a laminar plate, which after a long interval of time that admitted of its increase, was stripped away to make room for the habitation of the living and inhumation of the dead. In all the Wiltshire Tumuli it is invariably remarked that a cist or species of coffin is cut into the bottom of the chalk bed for the reception of the body, which is found with its legs under the thighs, with face to the east, an urn generally reversed reposing under its head, or placed on its breast,—with an elegantly indented and beautifully shaped cup of small dimensions (supposed by Sir R. Hoare to be a drinking cup) situated at his feet; arrow and spear heads of flint; axes of black stone or sienite are sometimes found, and articles of dress and ornament fashioned of bone.

Here, all along this passage, similar interments were evidently made. In the Wilts tumuli, there are occasionally found two or three successive depositions,—the first cut in the chalk, the flints and other circumstances clearly indicating the infancy, poverty, and rudeness of the people. This agrees with the *lowest* locality of flints in the cavern.

Overhead is found a second burial, with more elegantly fashioned flints, celts, breast plates of gold, beads of copper and tin, and clay—well-shaped baked pottery, indicating greater perfection in the art. These interments answer to the second in the cavern, made in the pits of stalagmite, where everything declares the advance of civilization,

such as the more elaborate pottery, celt axe of sienite, pins and bodkins and spear-heads of bone,—the screw ornament of copper, and piece of silver breast plate.

Thirdly, come the Romans recognizable in Samian pottery, turned on a lathe—of a fine earth—exquisitely figured and glazed.

These three epochs are marked by simple and distinct lines, which it is impossible for an unprejudiced mind to mistake. They are uniform and universal throughout the cavern, but owing to the stalagmite taking a more stratified and unobjectionable form in this branch the evidence is most clear and irresistible.

At the wings when the crust consists of pure and stratified spar unmixed with stones or foreign substances they have not been yet traced. It is only in those places which bear evidence of disorder and unceasing accession of extraneous matters superimposed on their surfaces that they are to be met with—e. g.—the lobby, Dome, and Upper Section.

They occur in greatest abundance near the common entrance,—in the space of a few feet about fifty of all sizes were found. Its proximity to the light naturally led to the choice of this passage.

While I incline to the opinion of the post-diluvial origin of these flints, I feel obliged in candour to state the grounds which would seem to countenance the opposite hypothesis, as exhibited by the circumstances of the knives.

1. The actual residence of the flints at the stated depths in the diluvium mingled confusedly among the bones, unconnected with the excavation of pits or ovens or other evidence of the post-diluvial visits of man.

The existence of the burnt bones is a sufficient answer to this difficulty. And had they been left by man on the antediluvial floor with the fossil bones by Hyenas they would have been found at the lowest as well as the highest situations.

2. The analogous circumstances of the knives and bones, the dis-severed portions of which lay apart from the corresponding parts as if they had been drifted forward from their original position simultaneously. And this circumstance furnishes a presumption that, like the bones, they had lain exposed on the floor at the time of the ingress of the mud.—To this it may be replied, that those who fabricated and used these flints may also have broken them and cast the fragments away.

3. Their existence in indurated masses consisting of decidedly antediluvian or diluvian materials, viz., fossil bones and rolled pebbles.

To these objections one simple answer will apply, that in case of these being similarly circumstanced with the bones, they should be expected to be similarly affected as the bones, and carried down to the lowest regions of the loam with them, but we have seen that they have never been observed there but invariably at or near the top of the loam,—and surely from their greater gravity they would have had a less chance than the bones of being floated up to the surface. Even if they had lain exposed on the floor along with the bones they could not have escaped uninjured, as we find them, but from their offering greater resistance than the softer and more yielding materials to the rocky fragments set in motion by the impetuous movement of the mud they would have been found crushed to atoms, in place of being, with one or two exceptions, entire.

With respect to the question implied by the Antediluvian origin of these flints, of the occupation of this and the neighbouring caves by antediluvian man, it may be observed in the first place, that the absence of human remains in all undisturbed deposits of fossil bones referrible to the deluge furnishes a presumption against the anomalous appearance of Kent's Hole. And it may be added that the existence of man seemed incompatible with the vicinity of the enormous multitudes of ravenous wild beasts which swarmed through the surrounding plains, filled every rock and retreat, and at their death contributed their bones to the heaps in the cavern.

If we even allow not only the existence of man but his actual presence in the cavern at the period preceding the deluge, we naturally look for his bones. Some relic of them would have descended to us with those of the animals which preceded or followed him, for surely where the strongest and most ferocious have fallen victims of each others violence, man could not have been respected; and applying the analogy of the modern Hyena's habits of exhuming the dead in Turkish cemeteries, to the antediluvian, they could have sought and dug out the bodies of the antediluvian dead and dragged them piecemeal into this common repository, along with those of other creatures which fell within their range.

Nor is the absence of human bones attributable to their greater tendency to decay than other bones, similarly circumstanced. From the exhumation and analysis of the bodies of members of the Cloven-gian dynasty of France, interred during a period of 900 years, it has been ascertained by Cuvier that they are not more perishable than those of other animals. In Egypt no difference is observed between the mummies of men and those of quadrupeds; nor do we find in

ancient fields of battle that the skeletons of men are more wasted than those of horses, except so far as they may have been influenced by size,—and we find among fossil remains the bones of animals as small as Rats still perfectly preserved. (Theory of the Earth, p. 120.)

Dr. Buckland states, that he possesses a human bone from Kent's Hole, but is uncertain as to its precise locality,—consequently nothing definite can be inferred from its discovery. I, too, have found human bones near the mouth—accompanied with pottery, shells, and ornaments made of bone. They were entombed in a pit excavated in the surface of the stalagmite, indicating comparatively modern sepulture,—probably about the time that the skeleton of Paviland cave was inhumed,—but in the decidedly diluvian deposit, no human tooth or bone has revealed itself. Over and over have I reviewed at my leisure every individual tooth and bone in my immense collection, but have found no trace of human remains amongst them.

From all these considerations it may be collected that man did not, at the epochs alluded to, co-exist in this country with the animal population, and that the latter held sovereign and undivided dominion over the tract above and the regions beneath. From hence, and from the different circumstances of the flints in the loam, we are also justified in concluding that these instruments owe their introduction to the era when the wild tenants of the woods and caves had ceased to exist, and were inhumed in the loam, and succeeded by savage man in the possession of both. Also, that this transfer of domain took place immediately after the events specified, is inferred from the position of the weapons above and in the surface of the loam previous to the advance of the crust,—and that man consequently became the allocated inhabitant of this region immediately after the deluge; which is assigning him a higher antiquity in this country than has been hitherto admitted.

Dr. Buckland is inclined to refer these flints to a more modern date, by supposing that the ancient Britains had scooped out ovens in the stalagmite, and that through them the knives got admission to the diluvium; and that in this confused state the several materials were agglutinated together in the manner of the mass containing the flint axe.

Without stopping to dwell on the difficulty of ripping up the solid floor which, notwithstanding the advantage of undermining, and the exposure of its edges, still defies our efforts, though commanding the apparatus of the quarry, I am bold to say, that in no instance have I discovered evidence of breaches or ovens in the floor, but one continuous plate of stalagmite, diffused uniformly over the loam;—along

the inclined planes of stalagmite in the sloping chamber, composed of the constantly accumulating rocky fragments precipitated from the upper eminences, no trace of the excavations alluded to at any stage of its growth was visible above the locality of the flints.

If the remains of these ovens were to be found clearly defined in any place, it would surely be at the sides, where the crust is free from admixture, consisting of pure carbonate of lime, regularly laminated. Within half a foot of the top of this bed, as has already been observed, a thin seam of dark mould has been traced;—in this mould were found burnt bones and charcoal—but they are not lodged in an artificial hollow, but simply repose on the pre-existent stratum of stalagmite which separated them from the diluvium—in the situation of substances deposited on a grave-stone, and subsequently overlaid by a similar slab—discovering no visible connection with the inhumed remains below. I have dug this seam nearly away, it is situated within three\* inches of the surface, in the passage into the Arcade, it is formed of the external mould such as is brought in by the feet of visitors, small polished pebbles of white flint and shells. More in the centre there was remarked a layer about two inches thick, consisting of smoke-colored bones of deer, accompanied by two jaws of hog exceedingly fresh, and strongly contrasting with the other discolored bones; the bones of rabbits and bats also occurred in the same bed; these various substances lay imbedded in a stratum of charcoal and burnt straw. The smoke-colored bones appeared to have been roasted on the fire of which the charcoal is the remains; the jaws of the hog had not been dressed. The depth of the cover or crust corresponded with that in the bear's den, and the bones of hog, charcoal, and shells, are of the same description as those found with the spear head, thus mutually explaining and connecting their anomalies, and are referrible to the same era when the people of that day hunted deer and boar, and launched the spear in the chase. The only vacuum observed during our workings was caused by irregularly piled masses from the roof, extending like arches across the diluvium or crust; generally lined with a waving crust, and those occasioned by the fox holes.

I have more than once adverted to the occurrence of flints in the upper division, under what has been deemed questionable circumstances. In describing the floor of that cave I dwelt upon its disturbed

\* In the original manuscript a rough sketch is given of the section of the stalagmite in which this seam occurs, from which it appears that the deposition above it varied in thickness considerably in different parts. This explains the apparent discrepancy in the text, and also the previous statement that it occurred half-way down, dividing the stalagmite into equal halves.



condition, arising from the operations of foxes in throwing up loose loam, and the occasional falling of masses from the roof. This loose loam, besides the fossil bones, exhibited heaps of Fox dung and heads of Dog and Badger,—in the midst of which were seen the beads, cylinders, pottery, and copper already noticed, with scales of Beetles. An accumulation of these materials, interspersed with rock fragments, the whole indurated to a breccia, constituting the covering of the diluvium to the depth of three feet. In this superficial bed I have detected flint relics, and have been assured by a rev. gentleman that he has found them in great abundance there,—but on the occasion of Dr. Buckland's last visit we were not so fortunate as to find even one, notwithstanding the examination of large masses of this bed, by the rev. gentleman himself and the rest of the party.

In the same manner as a straggling fossil tooth may be traced in it, so a casual flint may be dug out—but certainly not in abundance. The excavations in question, after great labour, I first opened and carried on to its present state,—not a shovel of stuff, modern or ancient that I did not examine,—and my experience would have surely enabled me to descry them if they occurred in such quantity, or in any quantity, and the circumstance of finding the cylinders and pottery made me more than ordinarily attentive,—but the result of my excavation of an area of seven yards was one flint in the disturbed bed, and the spear head (fig. —), and a few knives in the virgin loam, which is not a greater proportion than the other branches supplied. Their number is however of trifling importance compared with the fact of their occurrence in a modern heap,—but we have already seen that this heap also contained part of the materials of the diluvium,—the loam and bones; and that these knives were thrown up from the lower deposit is rendered certain by the occurrence of similar flints, and in greater abundance in the region of the loam which contains diluvial materials exclusively, like that in the other localities of the flints. If they had been found only in decidedly modern mould or even of a mixed character there would have been an end of the controversy, but the fact of their occurrence in the lower bed in greater number than in the upper sets the matter at rest.

No argument therefore of their modern origin can be drawn from their presence under the circumstances alleged; it has been proved that the bed which contains them consists of heaps of Diluvium thrown up from excavations of badgers and foxes, and mixed with the detritus from the roof and articles left there by man.

In relation to my statement of a continuous crust pervading the

surface of the diluvium, Dr. Buckland observes that the fact of an unbroken crust of stalagmite over any given spot in which a knife has been found is not decisive to shew that the Diluvium at that spot had not been broken into at some early post-diluvial period, and subsequently sealed over. The human skeleton in Burrington cave, in the Mendips, was buried under four or five inches of stalagmite. In most cases he contends the advance of the crust is progressive, either from a centre spreading circularly in all directions, where it enters by dripping from the roof or forming papillæ on the floor; or laterally progressive, when it oozes through the sides of the cave and spreads transversely or longitudinally, according to the inclination of the surface—but in all cases it is progressive. Its extremities are thin, its parts nearest the source of infiltration thickest,—a spot that is now covered by the march of these encrusting matters may have been open to receive impression from the hand of man, before the advancing and encrusting fluid arrived so far. To this just dissertation I may add in illustration the fact that groups of bones in German caves, which the stalactites formerly respected may be seen gradually disappearing under the accretion of them. (James' notes on Cuvier.) When the floor is a horizontal plane this description obtains,—but in inclined and rapid slopes the concretion matter flows down and accumulates at the foot against the opposing wall. This is the case in the sloping chamber,—the parts at the base which produced the knives must have been consequently the first overspread—and from the constant addition of rolling masses the covering of the diluvium, at this point, was thicker than in the upper parts. The calcareous fluid which formed the undulating pavement along this chamber was not derived from infiltrations dropping from the entire surface of the roof, but from the central masses of stalactites and lateral ducts or cascades. The union of these lateral and vertical streams diffused a plate of stalagmite low down near the wall of the cave, where there is no issue from the roof above. It is painful to dissent from so high an authority, and, more particularly so, from my concurrence generally in the views of the phenomena of the caves, which three years personal observation has in almost every instance enabled me to verify.

The savage hordes, whose primitive mode of life led them to range the country in pursuit of game, would naturally have followed it into its retreat in the open fissures and chambers of the rock,—and finding these securer shelter against the seasons, and still less friendly tribes, as well as a more convenient ambush for watching and surprising their prey, than the surrounding surface afforded, would seek to dislodge its

inhabitants and adapt these subterranean vaults for occasional, if not permanent, abode.

In those districts, the compact nature of whose strata is unfavourable to the existence of these natural cavities, we find that the early inhabitants of Britain excavated artificial caverns for their habitation. "From the softness of the red sandstone it has been frequently hollowed out into extensive artificial caverns, such as those near Nottingham, which as they gave rise to the name of the place, Snodingaham, 'the home of Caverns,' must have been of great antiquity, and probably may have formed the dwellings of the rude Aborigines.—There are similar but smaller excavations at Knaresborough, York, and at Guy's Cliff, Warwick. In the parish of Addingham (Cumberland), the Druidical temples, called Long Meg and her Daughters, were excavated out of red gritstone." (Coneybeare, p. 280.)

In the south-western extremity of Stoudon parish, Wilts, there is a large tract perforated into numerous hollows or excavations, which are popularly termed Pen Pits,—several thousand holes of various forms and dimensions extend over a surface of nearly 700 acres of ground; they are found on the brows and slopes of two hills—between which is a narrow valley. On a bold knoll projecting into this valley are traces and banks of an ancient encampment. These pits in their form resemble an inverted cone, and are of unequal dimensions,—in some instances they appear double or only divided by a very slight partition of earth. The most likely supposition is that they were permanent habitations. The custom of living underground is of very high antiquity, and is still practised by the inhabitants of Kamskatchka and other countries. (Britton's Wilts.)

The inhabitants of the upper region of Atlas live four months in the year in excavations of the mountains, viz., from November to February inclusive. (Rees' Cyc. article Morocco.)

The Links of Skail in Sandwick, one of the Orkneys, abound in barrows; some are formed of earth alone, others of stone, covered with earth. In the former was found a coffin made of six flat stones. They were too short to receive a body at full length; the skeletons found in them lie with the knees pressed to the breast, and the legs doubled along the thighs; a bag made of rushes has been found at the feet of some of these skeletons, containing the bones most probably of another of the family. In one were to be seen multitudes of small beetles; and as similar insects have been discovered in the bag which enclosed the sacred Ibis we may suppose that the Egyptians and the nation to

whom these tumuli belonged, might have had the same superstition respecting them. (Br. and Lon. Ency. Art. Barrow.)

Various arguments concur to shew that the Cavern reliques are referrible to the epoch of the occupation of Britain by the same people who raised the barrows and interred in their sepulchral urns precisely similar blades. Between the flints found in the caverns in Wiltshire and those collected from the caverns of Kent's Hole, Anstis' Cove, and Berryhead, there is a singular identity both of material and form. Excepting that the barrow specimens have a more polished head, apparently from friction on a flag, but exhibit no other evidence of superior art. None of the cavern blades appear to have been rubbed or polished, but exhibit the rough serrated edge of the original fracture. This difference alone may not be sufficient to authorize us in assigning to the cavern reliques a higher antiquity,—but the absence of other Druidical remains at the depth where the flints abound is a negative confirmation.

In a dark mould, mixed with disturbed loam, strewed over the floor of the upper division, there were detected various articles which appear to be identical with those found in the barrows alluded to, viz., fragments of sepulchral urns, which exhibit the zigzag mouldings of those from the barrows figured in Mr. Miles's memoir. Both are formed of a coarse clay, sun-baked, and turned on a lathe:—this analogy is rendered complete by the discovery in the cavern, associated with the pottery, of circular pieces of clay-slate, perforated, in some instances, in the centre, like the coal money found under similar circumstances in the barrows.

These circular pieces found in Kent's Hole and Berryhead are composed of shistose slate—and clay slate—but the pieces from the barrows consist of Kimmeridge coal, a fetid unctuous substance. For the uses to which they would appear to have been applied,—the nature of their substance was a matter of indifference, convenience alone seemed to regulate the selection. In the extensive potteries which at a remote period were carried on in the neighbourhood of Kimmeridge, circular plates of that coal were employed as centre pieces or bases for moulding the vases upon,—as these nuclei could not be separated from the bottom without injury they were left enclosed in the overlapping clay, and in this position became indurated. I am not aware that they were found in the position described, but the impression of them was observed,—and where the urns were decomposed or broken these parts fell out, and being of a more durable material were preserved.

The circumstance of their circular form and their occurrence like the oboli of the ancients in sepulchral urns gave rise to their popular appellation of Coal money.

#### ANSTEY'S CLIFF CAVERN.

The approach is over a Down whose surface is rugged and grey, with irregular ridges of limestone. Along the verge of the cliff facing the sea run deep vertical fissures parallel to one another. In one of these, the largest, I found a small skull adhering to the side, imbedded in diluvial mould. There was the appearance of stalactite on the scattered stones as if the superincumbent roof had fallen in, masses of rock lay in irregular heaps and, through them, I observed a dark subterraneous chamber not yet explored. As you descend from the Down to the Cave you wind by a circuitous path and arrive at the brow which falls perpendicularly to the sea, a depth of twenty feet; thence you ascend, obliquely, the steep rock and with difficulty gain the mouth. Looking up from below the eye is struck with the overhanging rock falling like a canopy over the entrance; distinct traces of stalagmite may be discovered running across the roof in parallel lines, it appears to have dropped like a curtain, but by the action of the air it has become detached. On your right is a niche with a mass of spar resembling the bust of a mailed warrior; the sides and floor of the mouth have lost their angular sharpness. From the mouth, which is nine feet high, and six broad, the cave contracts to five feet at its highest in the middle to three feet both in breadth and height; at the extremity it is as low as three feet; the total length is sixty-three feet. The stalagmite is thickest at the end where it rose in the form of a cone about three feet in diameter. Although the roof is crusted over and fifty feet below the surface of the Down, yet it would appear from the stained appearance after a storm that the rent extended upwards to the top, and this solves a doubt about a double stalagmite, as shall afterwards be shewn.

I commenced excavating at the very extremity which terminates in a *cul de sac* under the cone. A quantity of angular stones were lying against it, bound together by stalagmite, part of which still remains. Having penetrated the crust, which was about fourteen inches thick, I found immediately beneath it a bear's molar tooth, much discolored. I found it extremely laborious to prosecute my search; stones, some angular, a few rounded, with shells and bones, were so closely wedged together into a compact mass as if they had been violently driven

against the end, like masonry in cement. Helixes and such as were not clogged with the sediment and lodged there in the receding of the water were crusted over by the stalagmite and form a breccia of shells and teeth,—such is the specimen with the fox's tusk. Against the farthest extremity shells and bones were crowded, and on the retreat of the diluvial waters the lightest substances which floated in were deposited upon the heavier like the deposits of the last receding waves on the beach. Here were found the large bear's tusk, deer's horn (the only one), and fox's jaws, indiscriminately mixed, rather more to the centre were four deer's jaws, a young horse's tooth, merry-thought of birds, numerous small bones and tusks of fox, weasel, and others not known; also one white (baked like) knife. In the centre of the cave the superficial mould differed from the rest; there seems to have been a circular breach made in the body of the crust and loam. I found large pieces of something like charcoal with straws and twigs in a state of decay, brought there, as it would appear, for fuel, bones of sheep were found near, most likely the remains of the animals cooked. In looking for the stalagmite we excavated three or four feet but found none, the mould was dark and loose, and was evidently not all diluvial. On throwing it up we found the coin in Mr. Buckland's possession, and on further search the brass of the dagger-sheath, and the coin of Antoninus Augustus Pius, also the conical piece in the mould, fragments of flint (knives), pottery, white baked and varnished, fracture absorbent. In a shelf about two feet from the floor I found two tusks of fox and some small bones slightly incrustated with stalactite, no doubt extracted by those who broke up the floor, deposited them there, and forgot them. The sides of this part have been evidently broken with a rough instrument to enlarge the space.

It is worthy of remark that the bones of this cavern had lost their medullary substance it having been extracted by the animals of prey whose teeth are worn deep into their surfaces. It appears that the mud had been in a fluid state, having entered the cavities like wax into a mould. Splinters of bones, and those of the hardest kind most abounded. Only three or four perfect bones were found, and the good preservation and freshness of these afford a striking contrast to the decayed and greenish state of the rest, indicating different periods of deposit. They bear no marks of teeth, and may belong to the deer, whose jaws and bones were found in rather a sound state. The deer's jaws had a second set of teeth shooting up under the old, and a bear's tooth adheres to one attached by diluvial clay. Foxes' jaws were in greatest plenty greatly worn, dark colored, and all imperfect. Single

tusks of bears were numerous but no hyena. This small cave appears to have been but an arm of a larger one which has been carried away.

The word Ansty, or Anstis, comes from the Saxon (Heanstey), which means high station. There are several places in Devon which bear this designation, as East and West Anstey—also in Essex and Hertfordshire. It is singular that all lie adjacent to Roman earthworks and ways.

The table land above the cave is intersected by the remains of ancient lines of circumvallation. At the angles of the enclosures there are the traces of elliptic towers. There are distinctly traceable the vestiges of three walls or embankments extending from the edge of the coast to the new Teignmouth-road; equidistant from each other may be discerned four mounts made up of stone standing in the centre of the enclosure. Whether they are the remains of beacons, or cairns, cannot be at present ascertained, as they have been disturbed, and the stones scattered about. This ancient fortification covered the entire down between Babbicombe and Anstis Cove. The wall or partition which bisects it, although evidently ancient, is posterior to the station, the ditches being traceable beneath its foundation. The general's or consul's quarters would seem to have been placed on the inside of the rampart or breastwork save along the brow of the cliff, possessing a prospect and command of the camp stretched out towards the west, and from which the grand street directly emanates, with parallel lines and intersecting alleys produced by the division of the area into squares. The marks of the wheels are distinctly visible on the entire line of the streets. The southern line, on the side of Anstis Cove, is broken by the subsidence of the cliff producing a deep chasm, beyond which it is resumed and forms a junction with the great transverse beach at the extreme verge of the down near the Ilsham road.

The vestiges of raised lines are also preserved on the adjoining down, near Babbicombe, where, although now separated by a partition of stones on the side looking to the sea, the camp was invested by a double intrenchment ten feet deep.

The surface of both downs is strewed over with barrow-like mounds, generally of a circular shape. It appears that four of those on Anstis Cove down had been partially opened some years ago. Assisted by Mr. Whitehead, of Babbicombe, I retraced the examination of them, and also opened some maiden ones in the same field, but found nothing remarkable. They stand nearly in the centre of the squares, and command observation of the camp on Berryhead, which, added to the absence of sepulchral relics, renders it not improbable that they

were raised for signal-posts or land works for fixing the standards of the cohorts. After penetrating the angular stones and coarse vegetable mould at the depth of three feet we found the rock. The same was the case with those on the contiguous down, with one exception. This mound lies inside the division wall, is more elevated above the level than the rest. Here the depth of mould was greater, more crumbling, like that of a long closed grave. It discovered decided testimony of the hands that heaped it, in fragments of pottery, burnt clay, brick of a superior quality, charcoal, rounded and oblong pebbles for slings, with shells of patella and helix, but there was no appearance of an interment.

### CHUDLEIGH ROCK.

The Rock of Chudleigh, as it is commonly called, is an insular mass of transition limestone, rising up perpendicularly, like a huge fortress. It is separated from the corresponding strata by a deep ravine or valley, along which pours a copious stream, whence, since the time of the ancient Britons, it has borne the name of Ug-brook, or brook of the valley, and gives its appellation to Lord Clifford's noble park, which it bounds on the west. The rock, on both sides of the brook, exhibits almost every variety of cavern and fissure; of the former the most remarkable is that in the insular rock, which is generally distinguished as the Cave of Chudleigh. The mouth is about half way down the cliff, with its entrances facing the brook. The mouth is large, narrowing towards the top, not unlike a pointed Gothic archway, into which shape it was thrown by the sudden rupture and reuniting of the strata, the uppermost inclining against each other, leaving an open space below. The rent runs through the body of the rock, and admits the light through the opposite side; a few yards on the left there is a parallel fissure. Until within these few years this cave was an object of terror, and avoided as the haunt of Pixies, whose gambols have been distinctly heard and narrated by the country people and visitors; and even now such as have the hardihood to enter first propitiate the genii of the cave with an offering of a pin, which is solemnly inserted in a projecting stalactite half-way inside, which, when I recently visited the cavern, was studded over and bristling with pins. It is called the Pixies' pincushion. The omission of this rite is said to be followed by nocturnal visits from the angry spirits. Repeated searches for bones have been made here, principally by Dr. Buckland, accompanied by Sir P. Ash and Mr. Templer, the fruit of which was some remains of



Bear and fragments of other bones. I made one or two short visits for the same purpose, and found a few specimens, but at the pressing invitation of the noble proprietor I devoted some days to a systematic exploration of its contents, assisted by the Honble. N. Clifford. Where Dr. Buckland's party left off I continued to work, and sunk a shaft in quest of the bottom, to the depth of ten feet below the surface, but it seemed to dip to an indefinite depth, following the extent of the perpendicular fissure. I had also some more excavations made near the extremity of this left branch, and sunk a shaft there of still greater depth, till it appeared hopeless. The several excavations furnished generally similar facts. The constant resort and burrowing of rabbits, whose presence was attested by entire skeletons lying near the surface, impeded the increase of the crust. There was but a slight skim of stalagmite. The earth was dark and loose, and abounding in bones and horns, which belonged chiefly to the large stag, or red deer,—ox fresh and fetid. As the excavation deepened the bones became scarce, being confined, indeed, to a few solitary splinters, much decayed, referrible to the bear. The earthy deposit became, too, different, more sandy and full of pebbles, with numerous nodules of flint, quartz, sandstone and limestone, rounded at the angles ;—the earth heavy and mouldy, but, in its general character, bearing an affinity to that of the external plains, of which at a former period it constituted the covering. It has peculiar qualities which discriminate it from the deposits in the caves round Torquay, it is neither so ferruginous nor clayey, but its principal and distinguishing feature is the extraordinary abundance of pebbles of flint and gravel, thus identifying itself with the silicious stratum that overspreads the surface, on all sides, to a great extent. I was not able to detect any trace of Hyena's bones, nor do I think that the small splinters of bone found in the cave can, with any certainty, be traced to that animal, for although they are reduced to the general shape of Hyena's splinters, they do not bear his teeth marks or those transverse furrows which characterize the remains of his prey in Kent's Hole. The large bones were frequently found entire, and when broken it was generally at their weak part, near the centre, as if from collision.

#### UGBROOKE FISSURE.

It has been already remarked that the rock on the opposite side of the brook was also rent and cavernous. As the fissure of which we are about to speak is on the Ugbrooke side we shall distinguish it by the appellation of the Ugbrooke Fissure. Whilst the quarrymen were

cutting away the rock they broke into a vein of red clay cutting perpendicularly the face of the cliff. In clearing it away some large bones were observed, projecting among the rubble, and preserved. These bones were handed over to me, and I placed them, together with the other remains, in the possession of Lord Clifford. Having ascertained the necessary particulars from Mr. Chamber, who afforded me every facility and information, I ascended the rock with his son, who was present at the first discovery, and pursuing the investigation soon dug out both entire and fractured bones which are determined to belong to the ox. In the heart of the rock were masses of green and dun-stone, nodules of chert and flint, granite and sandstone.

Though in the vicinity of a noble Danish camp, with double vallum and fossi, within the area of which some rude coins and a celt were dug up, I sought in vain for any evidence of their visit to the Chudleigh cave; neither was I fortunate enough to discover any relic of art of a prior or posterior period. Its interest is entirely confined to its possessing fossil bones under the circumstances recorded, and the superstitious tales of the peasantry.

#### BUCKFASTLEIGH CAVE.

We next proceeded to the large cave adjoining the town of Buckfastleigh. On the occasion of my former visit I had also searched this cave, but without success. Several persons of experience have also searched it with like effect. The result of the second trial was but a confirmation of my former view, that the cave contains no vestige of diluvium, but merely contains such deposits of clay and vegetable mould as the rain continues to wash down through the crevices and rents. The stratum on the floor consists of alternating layers of pure red argile, compact as potters' clay, free from stones, gravel, or bones, and a blackish mould formed partly of decomposed vegetables intermixed with bats' dung,—through which were disseminated an occasional bone of rat, rabbit, and dog. This bed was irregularly divided by seams of stalagmite of unequal thickness. Within the memory of the old inhabitants this cavern stretched out fifty yards in front, and occupied all the area now occupied by the lime-kilns. The face of the excavated cave presents the most instructive section I have ever observed; it displays all the irregularity of winding and convolutions observable in Kent's Cavern, and shews two distinct levels or floors, yet communicating with chimney-like apertures with each other. The original floor of solid rock, along the

upper horizontal level, is seen covered, immediately, with a floor of stalagmite two and three feet thick, without the mediation of clay or rubble, or any other extraneous substance, which inclines me to think that this cave must have been once closed externally on all sides. The cave is of great magnitude, and before its excavation must have equalled Kent's Cavern in size. The stalactites are on a large and most striking scale.

The progress of quarrying has also laid open an extensive cave situated at the base of the hill on which the church stands. The mouth is capacious—splendid stalactites and numerous crystals. Mr. Lyte penetrated with great difficulty and hazard into an oven-like aperture at the western extremity, where he invited me to follow him. This part of the cave bore all the virgin character of having never been visited or disturbed; we clearly distinguished a solid and widespread crust, above which was heaped a stratum of water-worn gravel. We found no bones, neither had the workmen, although employed there for ten or fifteen years, and their fathers before them. There was no visible inlet. \* \* \*

#### ORESTON CAVE.

In the cavern discovered in 1816, the bones of the rhinoceros abounded, and prevailed exclusively.

In those of 1820, one cavern contained bones and teeth of the bear, while another contiguous cavity, of apparently coeval formation, contained only bones of deer and antelope.

In the caverns of 1822, which form the subject of the present notice, the bones of animals of several distinct genera are found, viz, bos, deer, hyena, wolf, and fox; these cavities communicated with each other, and the bones of the different graminivorous animals were found mingled together in the same cavity, but those of the carnivora at a considerable distance from each other.

Some of the bones lay on the surface of the clay and acquired a thin coat of stalagmite; but in none of them has it penetrated beyond the surface—the greater number were embedded in the stiff clay which adhered so firmly to them that many were broken by the workmen in separating them from the matrix—and others have fallen to pieces since their exposure to the air—but a great proportion of the cylindrical and other bones, of the graminivorous animals, in particular, are still as perfect in form as at the time of the death of the animals

to which they belonged, and do not exhibit the least appearance of having been gnawed or otherwise mutilated.

The radius of a young wolf appears to have been gnawed by a weasel, bearing the impression of the canines or incisors of an animal of that size.

The clay adhered so firmly to the surface of many of these bones that, unless removed with considerable caution, the outer layers separated along with it, and showed that but little animal matter remained; and on submitting these fragile portions to the action of dilute muriatic acid, they almost entirely dissolved, leaving scarcely any trace of animal matter. These bones contained one-third part less than the bones from Kirkdale. Is it not therefore probable, that the clay immediately surrounding the bones, which is of a darker color as well as more tenacious than that in which no bones are found—may have abstracted a large proportion of the animal matter, and be the principal cause of the extremely fragile state of the bones? for they are now so absorbent, that if the largest of them be applied to the surface of the tongue, they adhere so firmly as to support their whole weight. In this they resemble those bones which were discovered in 1816 and 1820, most of them being as white and fragile as though they had been calcined.

It would appear that the loss of animal matter and, consequently, decay or decomposition of fossil bones, depends very much upon the nature of the soil in which they are deposited, and on its elevation and different degrees of moisture at different periods, also, in a great measure, on the density or compactness of the bones themselves.

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